2.0 BACKGROUND AND PROJECT DESCRIPTION

This chapter describes the proposed statewide regulations and conditional waiver for on-site wastewater treatment systems (OWTS). Prior to that, it provides an overview of information about the typical use, siting, and operation of OWTS in California. This chapter also provides background on the number and locations of OWTS throughout California, information about public health and environmental concerns related to OWTS, and an overview of existing OWTS regulations in the state.

2.1 OVERVIEW OF OWTS USE AND SITING

OWTS treat wastewater and disperse effluent for the approximately 1.2 million California households and numerous businesses that are not connected to sewer systems and related centralized municipal wastewater treatment plants (CWTRC 2003). (This estimate reflects the number of systems in 1999.) Thus, approximately 10% of all California households, or about 3.5 million people, rely on some type of OWTS to treat and dispose of the wastewater they generate. According to the study cited above, the annual rate of growth in new OWTS installations is approximately 1%, or 12,000 systems.

OWTS are defined by the U.S. Environmental Protection Agency (EPA) as systems “relying on natural processes and/or mechanical components that are used to collect, treat, and disperse/discharge wastewater from single family dwellings or buildings” (EPA 2002). Most OWTS are commonly referred to as “septic systems”; however, many different types of systems exist. Conventional septic systems consist of a septic tank and subsurface dispersal system. A wide range of supplemental treatment devices can also be included in the septic system design to address different site constraints and achieve higher levels of treatment than that provided by conventional septic systems. Descriptions of the design and operation of conventional OWTS and a variety of supplemental treatment devices are provided in the following sections.

Proper site conditions are an important factor in ensuring the optimal functioning of an OWTS. A key issue that has an impact on the effectiveness of a treatment system and that may determine the need for additional treatment is the amount and type of soil available for treatment of the effluent. In practice, this is measured as separation between the bottom of the dispersal field and the groundwater table, bedrock, or impervious soil layer. If the OWTS is properly sited, unsaturated soil (soil above groundwater level) with sufficient depth underlying the dispersal fields can, through absorption, filtration, and other natural processes that break down some effluent pollutants, substantially reduce the levels of human pathogenic organisms (viruses and bacteria) and some chemical compounds in effluent before it reaches the underlying groundwater table or surface water that is hydrologically connected to the groundwater.

The depth and type of unsaturated soil below the dispersal system are the most important factors in the treatment process. The number of pathogens and other pollutants removed through this process increases with the length of time the OWTS effluent is retained in the unsaturated soil layer (i.e., the retention time). Note that, regardless of the length of time that wastewater is retained in the unsaturated soil layer, soil does not provide effective treatment of some soluble compounds that are resistant to biodegradation, such as nitrate. (This process, called denitrification, is described in more detail in Section 4.1, “Water Quality and Public Health.”).

Domestic wastewater entering septic systems also contains high levels of phosphorus. For properly designed and functioning septic systems, phosphate is removed in the leachfield by binding to porous media (Wilhelm et al. 1994, cited in Angenent et al. 2006). However, fractured bedrock and thin, sandy soils have limited capacity to bind phosphate, and unfavorable soil and water chemistry or saturation of the soil can allow the phosphate to be mobile (Robertson et al. 1998, cited in Angenent et al. 2006).

Deep unsaturated soils provide for relatively long retention times and are ideal conditions for promoting die-off of pathogens (viruses and/or bacteria). Such conditions are not present in many areas of California, however. Areas of the state with relatively porous, sandy soils allow OWTS effluent to move into local groundwater and other receiving waters very quickly and, therefore, with little treatment. In areas with underlying fractured and granitic bedrock, it is almost impossible to accurately predict how fast OWTS effluent will travel and the likely pathway that OWTS effluent will take before it reaches groundwater. In areas with poorly draining clay soils, OWTS effluent can pool at the surface, creating potential public health threats through direct human contact and through runoff to receiving waters intended for beneficial uses (e.g., drinking water, fisheries).

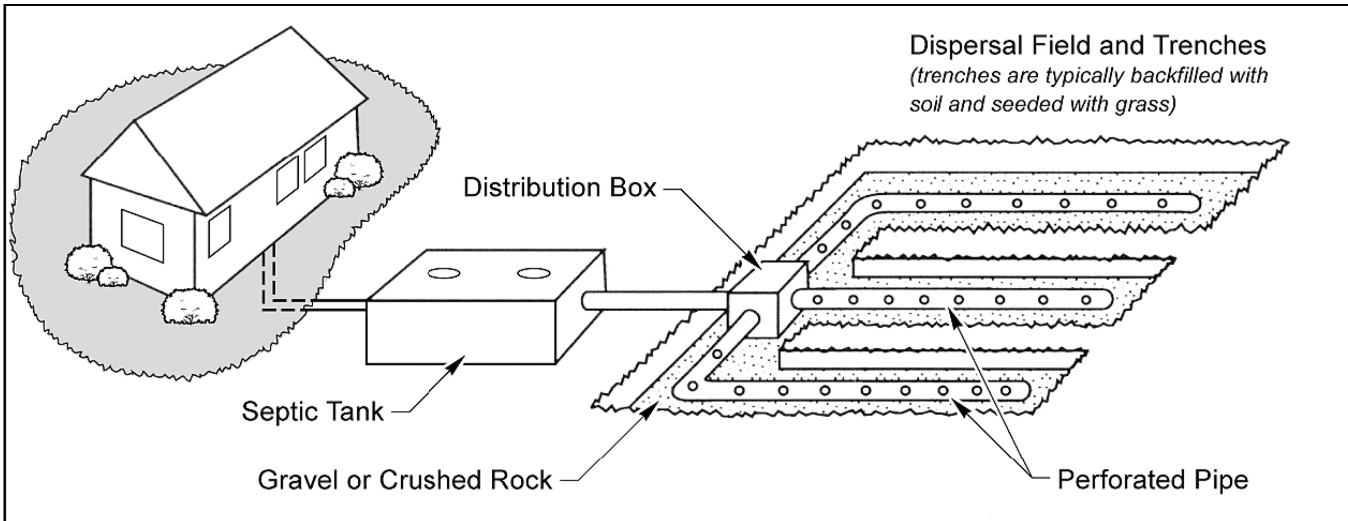
The distance to nearby drinking water wells or surface waters can also be a key issue. Frequently, properties served by OWTS are also served by private on-site ("domestic") water wells. In other cases, properties with OWTS may be located within the groundwater capture zone of a public drinking water well. Once in the groundwater, OWTS effluent travels as a plume (Robertson 1991). Depending on the direction of groundwater flow, nearby wells may be in the path of the effluent plume.

As stated above, OWTS are categorized in two groups: conventional OWTS and OWTS with supplemental treatment units. The proposed statewide regulations for OWTS would apply to all OWTS, with some exceptions. Each of these types of systems is described below.

2.2 CONVENTIONAL OWTS

The vast majority of existing OWTS are conventional systems and are designed to provide "passive" (i.e., minimally mechanical) operation and treatment of domestic wastewater. A conventional OWTS typically consists of a septic tank, a wastewater dispersal system, and the native underlying soil (Exhibit 2-1). Currently, local agencies regulate the siting and installation of conventional OWTS to meet their own requirements and those of the applicable Regional Water Quality Control Board (Regional Water Board).

This section describes the design and operation of the septic tank, design of dispersal systems, and the most common methods of wastewater dispersal used by the different conventional dispersal systems. The effectiveness of wastewater treatment by conventional OWTS is also discussed. Supplemental treatment options are addressed in Section 2.3, and community systems are described briefly in Section 2.4.



Note: This is a schematic diagram that is not to scale

Source: Adapted from EPA 2002

Elements of a Conventional System **Exhibit 2-1**

2.2.1 SEPTIC TANK

The septic tank serves a number of important functions, including the following:

- The septic tank removes oils and grease (floatable materials) and settleable solids. The septic tank is designed to provide quiescent conditions over a sufficient period to allow settleable solids to sink to the bottom of the tank and floatable materials to rise to the surface. The result of this primary treatment process is a middle layer of partially clarified effluent that exits the tank and is directed to the dispersal system.

- The septic tank stores settleable and floatable material. Tanks are generously sized according to projected wastewater flow and composition to accumulate sludge (settleable solids) and scum (floatable solids) at the bottom and top of the tank, respectively. Tanks require pumping at infrequent intervals, depending on the rate that sludge and scum accumulate. EPA indicates that pumping may be needed every 1–7 years (EPA 2002, Special Issues Fact Sheet [SIFS] 1).

- The septic tank allows digestion or decomposition organic matter. In the oxygen-deprived (anaerobic) environment found in a septic tank, several types of bacteria break down biodegradable organic molecules for further treatment in the soil or by other unit processes. This digestion can reduce sludge and scum volumes by as much as 40–50%.

2.2.2 WASTEWATER DISPERSAL SYSTEM

The dispersal system is where the septic tank effluent infiltrates the underlying soil. The soil is the final and most important treatment component for pathogen removal in a conventional OWTS.

Infiltrative surfaces are the areas in the dispersal system that are designated to accept OWTS effluent. The infiltrative surfaces in dispersal systems are located in either permeable, unsaturated natural soil or imported fill material so wastewater can infiltrate and percolate through the underlying soil to the groundwater. Permeable, unsaturated soil is native soil material that is not inundated by groundwater. As the wastewater infiltrates and percolates through the soil or fill, a variety of physical, chemical, and biochemical processes and reactions can filter or biodegrade some of the organic materials that remain after treatment in the septic tank (see Section 4.1, “Water Quality and Public Health,” for more detailed information about these processes). Many different dispersal system designs and configurations are used, but all incorporate soil infiltrative surfaces that are located in buried excavations (usually trenches or pits).

Wastewater dispersal systems provide both dispersal and final treatment of the applied wastewater. Wastewater is transported from the dispersal system through the infiltrative surface and the unsaturated zone in the soil. The transition zone between the infiltrative surface and the unsaturated zone, is only a few centimeters thick. It is the most biologically active zone and is often referred to as the “biomat.” Material in the wastewater that is rich in carbon is quickly degraded in the biomat, and ammonia and organic nitrogen are converted to nitrate immediately below this zone if sufficient oxygen is present. Free oxygen or combined forms of oxygen (e.g., iron oxide) in the soil must satisfy the oxygen demand generated by the microorganisms degrading the materials. If sufficient oxygen is not present, the metabolic processes of the microorganisms will be reduced or halted and both treatment and infiltration of the wastewater will be adversely affected (Otis 1985). The unsaturated soil surrounding the dispersal system provides a significant pathway for oxygen to enter the biomat, thus sustaining the organisms in the biomat (Otis 1997, Siegrist et al. 1986). Also, it is the primary zone where soil particles attract and hold contaminants through chemical and physical absorption (uptake into a solution) and adsorption (attachment onto the surface of particles). Pathogens and most phosphorus are removed in this zone (Robertson and Harman 1999, Robertson et al. 1998, Rose et al. 1999, Yates and Yates 1988).

DISPERSAL SYSTEM DESIGN

Several different designs are used for dispersal systems. They include trenches, beds, seepage pits, at-grade systems, and mounds. Applications of dispersal systems differ in their geometry and location in the soil. Trenches, the most commonly used design for wastewater dispersal systems, have a large length-to-width ratio, whereas beds have a wide rectangular or square geometry. Some jurisdictions require redundancy in the dispersal system (i.e., alternating fields, 100% replacement area) to provide for resting dispersal systems or in cases of failure, respectively.

The infiltration surfaces of dispersal systems may be created in natural soil or imported fill material. Most traditional systems are constructed below the ground surface in natural soil. In some instances, a restrictive horizon (or layer) above a more permeable horizon may be removed and the excavation filled with suitable porous material in which to construct the infiltrative surface (Hinson et al. 1994). Infiltrative surfaces may also be constructed at the ground surface (at-grade systems) or elevated in imported fill material above the natural soil surface (mound systems). An important difference between infiltration surfaces constructed in natural soil and those constructed in fill material is that a secondary infiltrative surface (which must be considered in design) is created at the fill/natural soil interface. This secondary infiltrative surface is sometimes the area where OWTS failure occurs because of the inability of that surface to accept wastewater. Despite the differences between the types of dispersal system designs, the mechanisms of treatment and dispersal are similar.

WASTEWATER DISTRIBUTION METHODS

The method and pattern of wastewater distribution in a dispersal system are important design elements.

Gravity Flow versus Pressure Distribution

Gravity flow and pressure distribution are the two most commonly used distribution methods. Gravity flow is the most commonly used method because it is simple and inexpensive. It can be used where there is a sufficient elevation difference between the outlet of the septic tank and the wastewater dispersal system to allow flow to and through the dispersal system by gravity. This method discharges effluent from the septic tank directly to the infiltrative surface as incoming wastewater displaces it from the tank(s). Typically, tank discharges are too low to flow throughout the entire distribution network and the soils near the beginning of the distribution network receive more flow. Thus, distribution can be unequal and localized overloading of the infiltrative surfaces can result, accompanied by poor treatment and soil clogging (Bouma 1975, McGauhey and Winneberger 1964, Otis 1985, Robeck et al. 1964). Pressure distribution, on the other hand, discharges wastewater effluent under pressure to the dispersal system. Pressurization causes the filling of the entire distribution network, which results in more uniform distribution of wastewater effluent over the entire dispersal system infiltrative surface.

Dosing, which can be incorporated into both gravity flow and pressure distribution systems, also increases the effectiveness of soil treatment. Dosing accumulates the wastewater effluent in a dose tank from which the water is periodically discharged in “doses” to the dispersal system by either a siphon (gravity-flow) or pump (pressure distribution). The treated wastewater is allowed to accumulate in the dose tank and is discharged when a predetermined water level, water volume, or elapsed time is reached. Dosing outperforms gravity displacement methods because the regulated volume and timing of doses provides opportunities for the subsoil to drain and re-aerate before the next dose arrives, resulting in more effective soil treatment of the discharged effluent (Bouma and Daniels 1974, Hargett et al. 1982, Otis et al. 1977). Pressure-dosing combines the benefits of pressure distribution and dosing. It is probably preferable over other distribution methods because it not only achieves more uniform distribution, which results in more complete use of the infiltrative surface, but also aids in maintaining unsaturated flow below the infiltrative surface, which results in wastewater retention times in the soil that are long enough to affect treatment and promote subsoil re-aeration.

Porous Media-Filled versus Aggregate-Free Trenches

Typically, a porous medium is placed below and around the distribution piping of the subsurface dispersal system. The porous medium keeps open the infiltrative area exposed to the wastewater and provides additional treatment surfaces. This approach is similar in most subsurface dispersal system designs, except when drip distribution or aggregate-free designs are used. In addition, the medium also supports the excavated sidewalls, provides storage of peak wastewater flows, minimizes erosion of the infiltrative surface by dissipating the energy of the influent flow, and provides some protection for the piping from freezing and root penetration.

Traditionally, washed gravel or crushed rock, typically ranging from three-quarters of an inch to 2½ inches in diameter, has been used as the porous medium. In addition to natural aggregates, gravel-less systems have been widely used as an alternative dispersal system medium. These systems take many forms, including open-bottomed chambers, fabric-wrapped pipe, and synthetic materials such as expanded polystyrene foam chips. Systems that provide an open chamber are sometimes referred to as "aggregate-free" systems, to distinguish them from others that substitute lightweight media for gravel or stone. Aggregate-free systems are essentially a half pipe placed in the trench with its inverted side down. These systems can provide a suitable substitute in locales where gravel is not available or affordable. Some systems (polyethylene chambers and lightweight aggregate systems) can also offer substantial advantages over the traditional gravel in terms of reduced site disruption because their light weight makes them easy to handle without the use of heavy equipment. This can reduce labor costs, limit damage to the property by machinery, and allow construction on difficult sites where conventional media could not reasonably be used. Reduced sizing of the infiltrative surface is often promoted as another advantage of the open chamber system. This is based primarily on the premise that these systems do not "mask" the infiltration surface as gravel- or other media-filled systems do where the media is in direct contact with the soil (Siegrist et al. 2004).

Shallow Dispersal

The proposed project requires that dispersal systems be designed and installed at the shallowest depth where aerobic treatment is enhanced by chemical and biological treatment processes. The most biologically active area in a soil column is the aerobic environment at or near the ground surface. An aerobic environment (oxygen rich) is desired for most wastewater treatment and dispersal systems. Aerobic decomposition of wastewater solids is significantly faster and more complete. Maximum delivery of oxygen to the infiltration zone is most likely to occur when dispersal systems are shallow (EPA 2002). This general requirement is important because the purpose of the proposed project is to properly treat OWTS wastewater.

Shallow dispersal methods, primarily drip distribution, which was derived from drip irrigation technology, is a method of pressure-dosed distribution capable of delivering small, precise volumes of wastewater effluent to the infiltrative surface. It is the most efficient of the distribution methods, and although it requires supplemental treatment, it is well suited for all types of dispersal system applications.

A drip line pressure network consists of several components:

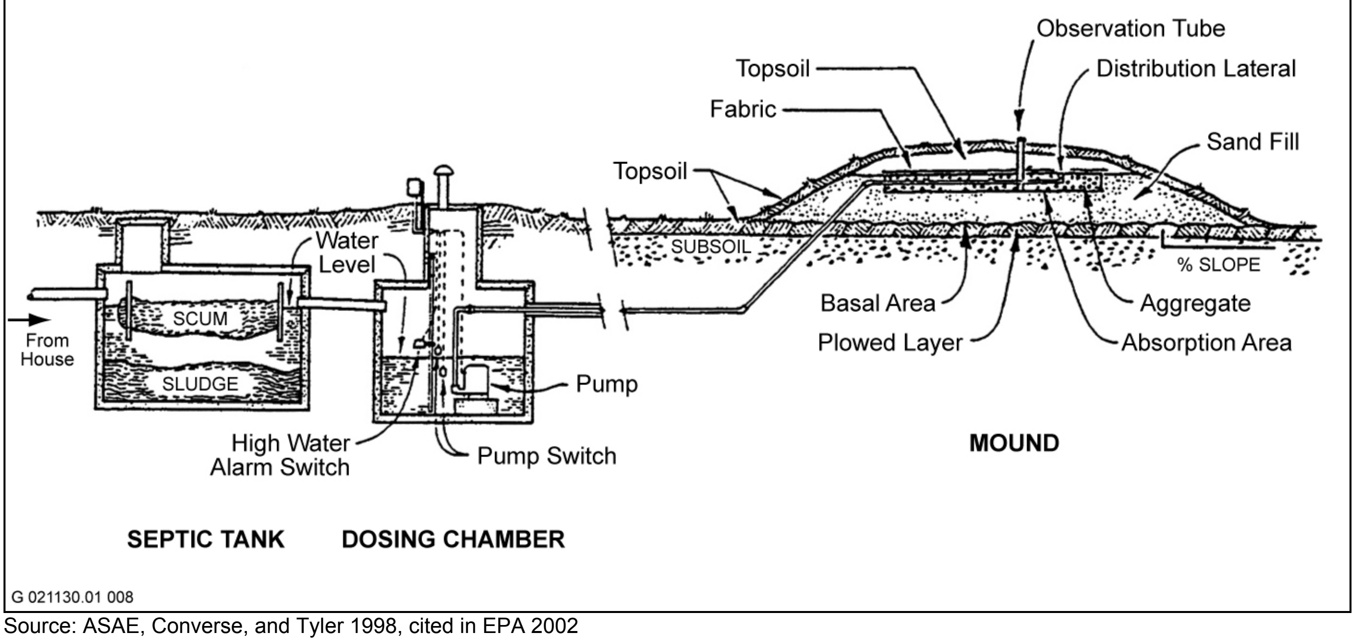
- dose tank,
- pump,
- prefilter,
- supply manifold,
- pressure regulator (when turbulent, flow emitters are used),
- drip line,
- emitters,
- vacuum release valve,
- return manifold,
- flush valve, and
- controller.

The drip line is normally a flexible polyethylene tube that is a half-inch in diameter with emitters attached to the inside wall spaced 1–2 feet apart along its length. Because the emitter passageways are small, friction losses are large and the rate of discharge is low (typically from 0.5 to nearly 2 gallons per hour). Usually, the drip line is installed in shallow (less than 1 foot deep), narrow trenches 1–2 feet apart and only as wide as necessary to insert the drip line using a trenching machine or vibratory plow. The trench is backfilled without any porous medium so that the emitter orifices are in direct contact with the soil. The distal ends of each drip line are connected to a return manifold. The return manifold is used to regularly flush the drip line.

Because of the unique construction of drip distribution systems, they cause less site disruption during installation, are adaptable to irregularly shaped lots or other difficult site constraints, and use more of the soil mantle and take advantage of plant uptake (absorption into the roots of plants) for treatment because of their shallow placement in the ground.

Mound

A mound system is a wastewater dispersal system placed above the natural surface of the ground (Exhibit 2-2). These systems are often used when a site has high groundwater, the soils are too shallow, or drainage is poor and thus conditions are unsuitable for the more common dispersal system described above. A mound is a layered structure consisting of a topsoil cap, a layer of sand or sandy loam, a geotextile layer, rock aggregate beds or trenches, a low-pressure distribution system, and an absorption area. In pressure-dosed mounds, primary treated effluent is dispersed into carefully chosen fill of permeable, well-drained sands, which contain a high volume of free air within the pore space.



Source: ASAE, Converse, and Tyler 1998, cited in EPA 2002

Elements of a Typical Mound System **Exhibit 2-2**

Because the effluent is distributed over a large area of sand, it moves slowly through the fill material and is in contact with air as it percolates downward. An elevated mound system is built above the native soil to achieve the required separation distance between the infiltrative surface and the limiting soil condition of the site. A mound has 1–2 feet of treatment media. The main goal is to preserve and use the natural soil conditions at the site. The wastewater must move into unsaturated soil for the microbes in the soil and in the biomat to feed on the waste and nutrients in the wastewater.

At-Grade System

The at-grade system is another example of a shallow dispersal system. They are typically used when sites have soils that are too deep to justify a mound and too shallow to permit a more conventional subsurface dispersal system. Unlike the mound, where a layer of sand material exists between the bottom of the absorption area and the ground surface, the ground surface is the bottom of the trench or infiltrative surface in an at-grade system.

Evapotranspiration/Infiltration

The evapotranspiration/infiltration (ETI) process is a subsurface system designed to disperse effluent by both evapotranspiration and infiltration into the soil. Evapotranspiration is defined as the combined effect of water removal from a medium by direct evaporation and by plant transpiration. This system is typically preceded by a pretreatment tank to remove settleable and floatable solids. Supplemental treatment may be used to minimize clogging of the ETI system piping and media.

The influent to the ETI unit enters through a series of distribution pipes to a porous bed. The surface of the sand bed is planted with water-tolerant plants. Effluent is drawn up through fine media by capillary wicking and evaporated or transpired into the atmosphere, and allowed to percolate into the underlying soil.

ETI systems are best suited for arid (evaporation exceeds precipitation) climates. These systems are often selected when site characteristics dictate that conventional methods of effluent dispersal are not appropriate (e.g., unprotected aquifer, high water table, shallow bedrock, tight soils). ETI systems can be employed to reduce the infiltrative burden on the site during the growing season. Such applications can also result in reduction of some nutrients, which are transferred to the overlying vegetation (EPA 1999).

Seepage Pit

Another type of subsurface dispersal system widely used in some areas of California is the seepage pit. However, seepage pits are not permitted in some jurisdictions because their depth and relatively small horizontal profile create a greater pollutant loading potential to groundwater relative to other subsurface infiltration methods (EPA 2002).

A seepage pit consists of a deep vertical circular hole with a porous-walled inner chamber, usually of premanufactured concrete rings with precut holes or notches, and a filling of gravel between the chamber and the surrounding soil. Seepage pits are generally installed in sandy or gravel-type soils. They are typically 4–12 feet in diameter and 10–40 feet deep. These dispersal systems operate as septic tank effluent enters the inner chamber and is temporarily stored there until it gradually seeps into the surrounding sidewall soil. Because seepage pits are often buried deep, they typically experience progressive biomat growth. As the biomat grows denser in the lower level, the effluent rises to a higher level, where it filters through the as-yet-unclogged sections of the sidewall.

2.2.3 Treatment Effectiveness of Conventional OWTS

If properly sited (i.e., with suitable soil and groundwater separation conditions), designed, and installed, conventional systems are capable of nearly complete removal of suspended solids, biodegradable organic compounds, and fecal coliform bacteria. However, other pollutants may not be removed as effectively. For example, conventional systems are expected to remove no more than 10–40% of the total nitrogen in domestic wastewater. Other pollutants that may not be completely removed include pharmaceuticals, other synthetic organic chemicals and viruses.

SEPTIC TANK OUTLET (EFFLUENT) FILTERS AND PUMP VAULTS

An effluent filter in a septic tank is a screen device installed at the septic tank outlet to catch solid particles before they enter the dispersal field. Results of a survey conducted in June 2004 indicate that about half of all State and local agencies currently require the use of an effluent filter with a septic tank; most older septic tanks were not constructed with filters. The use of an effluent filter can significantly improve effluent quality and protect dispersal field functioning by preventing carryover of solids to the dispersal field. Most manufacturers offer models of filters that are located inside the septic tank (attached to the outlet) or systems that are located outside of the septic tank in a separate tank (i.e., pump vault). Most systems are also available with an integrated pump, for use with septic tanks designed with effluent pump systems or other pressure distribution systems. The effluent filters must be cleaned at regular intervals, as recommended by the manufacturer and depending on usage, to remove accumulated solids from the screen to prevent system backups into the building served by the OWTS.

SEPTIC TANK ADDITIVES

Approximately 1,200 septic tank additives are promoted as being able to improve the operation of septic tanks, reduce odors associated with septic systems, or unclog soil adsorption systems. These products fall into three general categories: inorganic compounds (usually strong acids or alkalis), organic solvents (often chlorinated hydrocarbons), and biological additives (bacteria or enzymes). Most studies have concluded that these products are not effective and in some cases are detrimental to OWTS (EPA 2002, SIFS 1). Inorganic compounds, such as hydrogen peroxide or other strong alkalis or acids, can adversely affect biological decomposition processes, degrade soil structure, and cause structural damage to treatment systems. Organic solvents are commonly used as degreasers but pose significant risks to groundwater and wastewater treatment processes by destroying populations of helpful microorganisms in the treatment system. Biological additives, such as bacteria and extracellular enzymes mixed with surfactants or nutrient solutions, do not significantly enhance normal biological decomposition processes in the septic tank and may increase loadings of biochemical oxygen demand (BOD), total suspended solids (TSS), and other contaminants (EPA 2002, SIFS 1). Use of other products advertised to control septic odors by killing bacteria run counter to the purpose and function of septic tanks, which are designed to promote anaerobic bacterial growth. Another variety of consumer product is marketed for its ability to remove phosphorus, a nutrient that, when available in sufficient quantities in surface waters, can result in nuisance algal blooms that may cause low oxygen conditions and fish mortality. This product can destroy the microbial population in the septic tank by eliminating the system’s capacity to buffer (or adjust to) changes in pH, which can result in a drop in pH and can severely compromise the function of additional wastewater treatments (i.e., supplemental treatment units) in the treatment train.

2.3 SUPPLEMENTAL TREATMENT UNITS

Supplemental treatment units are “active” operation devices incorporated into the treatment train of an OWTS following the septic tank, or in place of the septic tank, to provide additional wastewater treatment before the wastewater enters the dispersal system. OWTS with supplemental treatment units achieve a higher level of treatment than conventional OWTS. Currently, some but not all local agencies allow and regulate the use of OWTS with supplemental treatment units, usually to address site or soil limitations that would otherwise substantially reduce the ability of a conventional OWTS to effectively treat wastewater constituents (especially pathogens [bacteria and viruses] and nitrogen) to meet local and Regional Water Board requirements.

This section provides descriptions of several varieties of active wastewater treatment systems: aerobic treatment units, anoxic systems, and disinfection systems. These are the major types of supplemental treatment units employed in California, as summarized from *Review of Technologies for the Onsite Treatment of Wastewater in California* (State Water Board 2002). More information is provided in Appendix D, “Background Information on OWTS.”

2.3.1 AEROBIC TREATMENT UNITS

Aerobic treatment units (ATUs) are a broad category of pre-engineered wastewater treatment devices for residential and commercial use. They provide a secondary level of wastewater treatment, which means they are designed to oxidize both organic material and ammonium-nitrogen (to nitrate-nitrogen), decrease suspended solids concentrations, and reduce concentrations of pathogens. ATUs may provide treatment using suspended-growth elements (activated sludge process), attached-growth elements (i.e., trickling biofilters), or in the case of hybrid aerobic systems, suspended-growth processes combined with attached-growth components (see Appendix D for a description of these processes).

Although they reduce concentrations of pathogens beyond the level allowed by a septic tank alone, most ATUs do not sufficiently reduce pathogens on their own to meet regulatory requirements. Additional disinfection can be achieved through chlorination, ultraviolet (UV) radiation, ozonation, and/or soil filtration. Increased nitrogen removal (denitrification) can be achieved by modifying the treatment process to incorporate an anaerobic/anoxic step or by adding the following treatments to the treatment train.

- **Suspended-Growth Aerobic Treatment Units:** In a suspended-growth aerobic treatment unit, microorganisms maintained in suspension using aeration provide aerobic treatment of the wastewater. Such designs typically consist of aeration, clarification, sludge return processes, and sludge wasting processes. The principal types of processes are classified as continuous flow reactor, sequencing batch reactor, and membrane bioreactor.

- **Attached-Growth Aerobic Treatment Units (Trickling Biofilters):** Treating wastewater by trickling it over a biofilter is among the oldest and most well-characterized technologies for aerobic treatment. The trickling biofilter system basically consists of a medium (sand, gravel, or synthetic) on which a microbial community (biofilm) develops, a container or lined excavated pit to house the medium, a system for applying the wastewater to be treated to the medium, and a system for collecting and distributing the treated wastewater.

- **Hybrid Aerobic Treatment Units:** Hybrid ATUs combine suspended- and attached-growth elements.

2.3.2 ANOXIC SYSTEMS

Anoxic treatment processes are characterized by the absence of free oxygen from the treatment process. Many aerobic treatment systems use anoxic or anaerobic stages to accomplish specific treatment objectives. Anoxic processes are typically used for the removal of nitrogen from wastewater through a process known as denitrification. Denitrification requires that nitrogen first be converted to nitrate, which typically occurs in an aerobic treatment process, such as a trickling filter or suspended-growth process. The nitrified water is then exposed to an environment without free oxygen. Organisms in this anoxic system use the nitrate and release nitrogen gas. Efficient denitrification processes need a carbon source that is readily biodegradable.

2.3.3 DISINFECTION SYSTEMS

Waterborne pathogens found in the United States include some bacteria, protozoans, and viruses. The process of disinfection destroys pathogenic and other microorganisms in wastewater and can be used to reduce the possibility of pathogenic organisms entering the environment.

Currently, the effectiveness of disinfection is measured by the use of indicator bacteria. Indicator bacteria are selected groups of microorganisms that indicate the possible presence of disease-causing pathogens. It is difficult to detect all types of pathogenic organisms in water because of the wide array of microbes that occur in the natural environment. As a solution, indicator organisms that are easy to detect are typically used.

A number of methods are available to disinfect wastewater. The most common types of on-site disinfection units use chlorine tablets, ultraviolet radiation, and ozonation. These approaches and their effectiveness are summarized below and described in more detail in Appendix D.

CHLORINATION

Chlorine is a powerful oxidizing agent and has been used as an effective disinfectant in water and wastewater treatment for a century. For small on-site wastewater treatment systems, the most common type of disinfection equipment is the tablet chlorinator because it does not require electricity, is easy to operate and maintain, and is relatively inexpensive.

Chlorinated water may inhibit the performance of subsequent soil treatment in the dispersal system because of its toxicity to soil microorganisms. In some cases, chlorination has been used to inhibit biological growth in trickling filter systems. In areas where water is distributed for irrigation, chlorine is used to prevent the spread of disease through wastewater.

There have been few field studies of tablet chlorinators, but those conducted for post-sand filter applications show significant fecal coliform reductions (2–3 logs per 100 milliliters [ml] [EPA 2002]).

ULTRAVIOLET RADIATION

UV light is an effective disinfectant for water and wastewater. The germicidal properties of UV irradiation have been recognized for many years, and the technology is widely available and well characterized. UV is germicidal in the wavelength range of 250–270 nanometers. The effectiveness of UV irradiation highly depends on the quality of the wastewater to be treated. Wastewater particles have the ability to absorb UV radiation, yet the only UV radiation effective in destroying microorganisms is that which reaches the surface of the microorganisms. Lower levels of turbidity and suspended solids in the wastewater therefore lead to greater microorganism inactivation and result in improved disinfection.

OZONATION

Ozone is a strong oxidant that has been used for the disinfection of water and wastewater. Because ozone is not chemically stable, it must be generated on-site near the point of use, making the system more complex than tablet chlorinators. It has been used in combination with other compounds for advanced oxidation treatment of wastewater. Ozone is used primarily for medium and large treatment facilities; however, ozone disinfection may become feasible for small systems in the future.

2.4 COMMUNITY SYSTEMS

Community systems, also known as shared systems, cluster systems, and community septic systems, are OWTS for serving more than one property owner. Either a conventional OWTS or an OWTS with supplemental treatment can be used in a community system, depending on the type of soil underlying the dispersal field, the depth to groundwater, the proximity to wells or sensitive surface water resources, and other factors. Because the proposed regulations do not address the scale of the treatment systems and focus instead on the wastewater treatment capabilities of conventional OWTS and supplemental treatment units, community systems are not discussed further in this environmental impact report (EIR) because the per capita impact on community systems is not believed to be different from smaller OWTS.

2.5 ESTIMATED NUMBER OF OWTS IN CALIFORNIA

From 1970 through 1990, the U.S. Census Bureau, as part of its decennial housing and population census, collected information on the number of housing units using septic systems for sewage disposal. (This information was not collected as part of the 2000 Census.) Table 2-1 shows the results of the census surveys for 1970, 1980, and 1990 in California. The percentage of occupied year-round housing units using septic systems in California declined between 1970 and 1980, but stabilized between 1980 and 1990. As Table 2-1 shows, the percentage of housing units on septic systems fell from 12.2% to 10.0% between 1970 and 1980, but declined only slightly, to 9.8%, by 1990. Excluding seasonal and vacant housing units, approximately one million housing units were hooked up to septic systems in 1990.

Table 2-1
Number of Housing Units with On-Site Wastewater Treatment Systems in California, 1970–1990

Year	Number of Housing Units with Septic Tanks or Cesspools	Percent of Total Housing Units	Percent of Total Households
1970	853,013	12.2	12.9
1980	920,690	10.0	10.7
1990	1,092,174	9.8	10.5

Note: Housing unit totals do not include seasonal and vacant housing units.
Sources: U.S. Census Bureau 2002, 2006

2.5.1 EXTRAPOLATION OF NUMBERS OF FUTURE OWTS

A 2003 study jointly prepared by the California Wastewater Training & Research Center at California State University, Chico (CSUC), and EPA estimated that 1,202,300 housing units were using septic systems in 1999. According to the study, this estimate was prepared by adding the number of OWTS installed since 1990 to the number of systems reported by the 1990 Census. The source for the number of systems installed since 1990 came from a survey distributed to public agencies that have jurisdiction for approving and inspecting OWTS in California. The CSUC-EPA study estimated that 9.9% of all housing units in California were using septic systems, virtually the same as the percentage reported by the 1990 U.S. Census (9.8%). The economic and fiscal analysis summarized in Chapter 5 provides a breakdown of OWTS estimates by county for 1990, 1999, and 2000 (based on the U.S. Census). As shown in Chapter 5, the percentage of housing units using OWTS varies by county, with the predominantly urban counties having notably lower percentages than the predominantly rural counties.

The California State Water Resources Control Board (State Water Board) has decided to use both the 2000 Census–based and 1999 CSUC-EPA estimates as the basis for projecting OWTS usage at the county level for existing (2008) and future no-project (2013) conditions for purposes of this EIR and the economic and fiscal analysis conducted for the proposed statewide regulations. Thus, a range of the estimated number of OWTS was developed and is used where appropriate in this EIR and the economic and fiscal analysis summarized in Chapter 5. A range of approximately 1,323,500 (using the Census-based projection) to 1,344,300 housing units (using the CSUC-based projection) is expected to use OWTS in California in 2008, a difference of approximately 1.6%. In 2013, under no-project conditions, it is expected that approximately 1,438,000 housing units (using the Census- based projection) to 1,460,600 housing units (using the CSUC-based projection) would be using OWTS, also a difference of approximately 1.6%.

2.5.2 ESTIMATED NUMBER OF OWTS WITHIN 600 FEET OF CERTAIN TYPES OF IMPAIRED SURFACE WATER BODIES

Under Section 303(d) of the Federal Water Pollution Control Act (FWPCA), states are required to develop lists of surface water bodies that are not attaining water quality objectives (i.e., found to be polluted). Section 303(d) requires that the state develop a total maximum daily load (TMDL) for each of the listed pollutants causing the impairment. The TMDL is the amount of loading that the water body can receive and still be in compliance with water quality objectives. The TMDL must include an implementation plan to reduce the loading of a specific pollutant from identified sources to achieve compliance with water quality objectives. The TMDL prepared by the state must include an allocation of allowable loadings to point and nonpoint sources, with consideration of background loadings and a margin of safety. The TMDL must also include an analysis that shows links between loading reductions and the attainment of water quality objectives. EPA must either approve a TMDL prepared by the state or, if it disapproves the state's TMDL, issue its own. Federally regulated discharges of waste under the National Pollutant Discharge Elimination System permit program must be consistent with the waste load allocation prescribed in the TMDL. Implementation of the TMDL should result in compliance with water quality objectives and removal of the surface water body from the 303(d) list. In California, TMDLs are adopted by Regional Water Boards, approved by the State Water Board, and transmitted to the EPA for approval.

The proposed statewide regulations are expected to affect OWTS within 600 feet of surface water bodies that:

- have been listed as impaired under Section 303(d) of the Clean Water Act;
- are impaired because of nitrogen or pathogens; and
- have had TMDLs adopted for them by the local Regional Water Board, including a determination that OWTS are contributing to the nitrogen and/or pathogen impairments.

Table 2-2 presents an estimate of the existing number of OWTS found within 600 feet of each of the types of impaired water bodies described above. This estimate is based on the assumption that only homes and businesses within 600 feet of the impaired water bodies would be affected. The counts are based on an investigation using multiple sources: The main sources for this investigation are TOPO! (a U.S. Geological Survey [USGS] map-based program), Zillow.com, Realtor.com, and Google Maps. TOPO! was used to track water bodies through forest canopy, urban settings, and in some areas where the water body had few distinguishing features from the surrounding landforms. Zillow.com and Realtor.com were used to identify whether the area was connected to a public sewer system by identifying existing structures for sale in the area and determining, based on the property listing, whether it was served by an OWTS. In addition, Zillow.com and Google Maps were used to perform an actual rooftop estimate by either counting rooftops directly or assuming a density. (Density estimates were performed in areas with tree canopy or high density.) In all cases, only structures adjacent to the actual water body were included in the estimate.

Table 2-2
Estimated Locations and Numbers of OWTS Adjacent to Impaired Waters That Would Be Subject to Section 30040 of the Proposed Regulations

Listed Water Body	County	Impairment*	Estimated OWTS Within 600 Feet of Impaired Water Body
Malibu Creek (entire watershed)	Los Angeles	Bacteria, nutrients	800
Northern Santa Monica Bay Beaches	Los Angeles	Bacteria, nutrients	1,563
Santa Clara River	Ventura/Los Angeles	Bacteria, nutrients	200
Canyon Lake	Riverside	Bacteria, nutrients	0
Lake Elsinore	Riverside	Nutrients	35
Rainbow Creek	San Diego	Nutrients	200
Total			**2,798**

* Bacteria = identified in the pathogens, fecal coliform, total coliform, bacterial indicators, beach closure, Enterococci, enteric viruses, or high coliform count. Nutrients = identified in the TMDL as nutrients, nitrite, nitrate, nitrate as nitrogen, nitrate as nitrate, ammonia, eutrophic contamination, or algae.

Source: EPA 2006; State Water Board 2007, 2008

In addition to the nine water bodies identified in Table 2-2 where TMDLs have been adopted and Regional Water Boards have determined that OWTS are contributing to impairment, an additional four water bodies are believed to qualify for the exemption that effectively would exempt them from complying with Section 30040 because they have existing regulatory actions to address the pollution (shown in Table 2-3). An additional 296 water bodies are impaired in the state because of nitrogen or pathogens but have not yet had TMDLs adopted by the local Regional Water Board. These water bodies are listed in Table 2-4. These water bodies may be subject to the requirements in Section 30040 of the draft regulations.

Table 2-3
OWTS Adjacent to Impaired Water Bodies
That Are Expected to Be Exempt from Section 30040 of the Proposed Regulations

Listed Water Body	County	Impairment*	Estimated OWTS Within 600 Feet of Impaired Water Body
Napa River	Napa	Nutrients	350
Sonoma Creek	Sonoma	Nutrients	200
Tomales Bay	Marin	Bacteria, nutrients	350
San Lorenzo River Basin	Santa Cruz	Bacteria, nutrients	4,000
Total			**4,900**

* Bacteria = identified in the pathogens, fecal coliform, total coliform, bacterial indicators, beach closure, Enterococci, enteric viruses, or high coliform count. Nutrients = identified in the TMDL as nutrients, nitrite, nitrate, nitrate as nitrogen, nitrate as nitrate, ammonia, eutrophic contamination, or algae.

Source: EPA 2006, State Water Board 2007, 2008

Table 2-4
Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies
that May Be Subject to Section 30040 of the Proposed Regulations
Once TMDLs Are Adopted

Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Region 1 – North Coast			
Americano Creek	Sonoma	Nutrient	110
Americano Estuary	Sonoma	Nutrient	10
Klamath	Siskiyou/Humboldt	Nutrient	1,500
Laguna de Santa Rosa	Sonoma	Nutrient	20
Russian River	Sonoma	Bacteria	300
Salmon River	Siskiyou	Nutrient	150
Shasta River	Siskiyou	Nutrient	80
Santa Rosa Creek	Sonoma	Bacteria	0
Stemple Creek	Sonoma	Nutrient	65
Subtotal			**2,235**
Region 2 – San Francisco Bay			
Islais Creek	San Francisco	Bacteria	0
Lagunitas Creek	Marin	Bacteria	120
Marina Lagoon	San Mateo	Bacteria	0
Mission Creek	Alameda	Nutrient	10
Pacific Ocean Fitzgerald Marine Reserve	San Mateo	Bacteria	0
Pacific Ocean at Pacifica State Park	San Mateo	Bacteria	0
Pacific Ocean at Pillar Point	San Mateo	Bacteria	0
Pacific Ocean at Rockaway Beach	San Mateo	Bacteria	0

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Pacific Ocean at Venice Beach	San Mateo	Bacteria	0
Petaluma River	Sonoma	Bacteria	35
Pomponio Creek	San Mateo	Bacteria	15
Richardson Bay	Marin	Bacteria	0
San Gregorio Creek	San Mateo	Bacteria	40
San Pedro Creek	San Mateo	Bacteria	0
San Vicente Creek	San Mateo	Bacteria	10
Suisun Marsh Wetlands	Solano	Nutrient	250
Walker Creek	Marin	Nutrient	60
Subtotal			**540**
Region 3 – Central Coast			
Alamo Creek	San Luis Obispo	Bacteria	22
Alisal Creek (Salinas)	Monterey	Bacteria	20
Aptos Creek	Santa Cruz	Bacteria	75
Arroyo Burro Creek	Santa Barbara	Bacteria	16
Atascadero Creek	San Luis Obispo	Bacteria	70
Blosser Channel	Santa Barbara	Bacteria	1
Bradley Canyon Park	Santa Barbara	Bacteria	20
Bradley Channel	Santa Barbara	Bacteria	2
Carbonera Creek	Santa Cruz	Bacteria	170
Carpenteria Creek	Santa Barbara	Bacteria	24
Carpenteria Marsh	Santa Barbara	Nutrient	50
Cholame Creek	Monterey/San Luis Obispo	Bacteria	52
Chorro Creek	San Luis Obispo	Bacteria	20
Chumash Creek	San Luis Obispo	Nutrient	0
Corralitos Creek	Santa Cruz	Bacteria	200
Dairy Creek	San Luis Obispo	Nutrient	25
Elkhorn Slough	Monterey	Bacteria	130
Espinosa Slough	Monterey	Nutrient	20
Gabilan Creek	Monterey/San Luis Obispo	Bacteria	0
Golita Slough	Santa Barbara	Bacteria	0
Llagas Creek	Santa Clara	Bacteria	300
Lompico Creek	Santa Cruz	Bacteria	200
Los Osos Creek	San Luis Obispo	Bacteria	140
Main Street Canal	Santa Barbara	Nutrient	9
Mission Creek	Santa Barbara	Bacteria	20
Morro Bay	San Luis Obispo	Nutrient	0 (Prohibition Area)
Moss Landing Harbor	Monterey	Bacteria	0
Nipomo Creek	San Luis Obispo	Bacteria	90
Old Salinas River	Monterey	Bacteria	20
Orcutt Solomon Creek	Santa Barbara	Bacteria	35
Oso Flaco Creek	Santa Barbara	Bacteria	10
Oso Flaco Lake	San Luis Obispo	Bacteria	2
Pacific Ocean at Arroyo Burro Creek	Santa Barbara	Bacteria	4
Pacific Ocean at Carpenteria State Beach	Santa Barbara	Bacteria	0
Pacific Ocean at East Branch Mission Creek	Santa Barbara	Bacteria	0
Pacific Ocean at East Branch Sycamore	Santa Barbara	Bacteria	0

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Creek			
Pacific Ocean at Gaviota Beach	Santa Barbara	Bacteria	3
Pacific Ocean at Hammonds Beach	Santa Barbara	Bacteria	0
Pacific Ocean at Hope Ranch	Santa Barbara	Bacteria	60
Pacific Ocean at Jalama Beach	Santa Barbara	Bacteria	7 (WDRs)
Pacific Ocean at Ocean Beach	Santa Barbara	Bacteria	0
Pacific Ocean at Point Rincon	Santa Barbara/Ventura	Bacteria	63
Pacific Ocean at Refugio Beach	Santa Barbara	Bacteria	4 (WDRs)
Pajaro River	Santa Clara/Benito/Monterey	Nutrient	125
Pennington Creek	San Luis Obispo	Nutrient	10
Salinas Reclamation Canal	Monterey	Bacteria	0
Salinas River	Monterey/San Luis Obispo	Bacteria	270
Salinas Lagoon (North)	Monterey	Nutrient	1
Salinas River Refuge Lagoon	Monterey	Nutrient	0
San Benito River	San Benito	Bacteria	100
San Bernardo Creek	San Luis Obispo	Bacteria	40
San Lorenzo Creek	Monterey	Bacteria	17
San Luis Obispo Creek	San Luis Obispo	Nutrient	70
San Luisito Creek	San Luis Obispo	Nutrient	30
Santa Maria River	San Luis Obispo/ Santa Barbara	Bacteria	50
Santa Ynez River	Santa Barbara	Nutrient	160
Schwan Lake	Santa Cruz	Bacteria	0
Shingle Mill Creek	Santa Cruz	Nutrient	300
Soquel Lagoon	Santa Cruz	Bacteria	0
Tembladero Slough	Monterey	Bacteria	2
Tequisquita Slough	Santa Clara	Bacteria	31
Valencia Creek	Santa Cruz	Bacteria	100
Waddell Creek (East Branch)	Santa Cruz	Nutrient	5
Walters Creek	San Luis Obispo	Bacteria	10
Warden Creek	San Luis Obispo	Bacteria	20
Watsonville Slough	Monterey	Bacteria	20 (5 if PD fully sewered)
Subtotal			**3,245**
Region 4 – Los Angeles			
Abalone Cove Beach	Los Angeles	Bacteria	0
Arroyo Seco Reach 1	Los Angeles	Bacteria	0
Arroyo Seco Reach 2	Los Angeles	Bacteria	0
Ashland Avenue Drain	Los Angeles	Bacteria	0
Avalon Beach	Los Angeles	Bacteria	0
Bollona Creek	Los Angeles	Bacteria	0
Bollona Creek Estuary	Los Angeles	Bacteria	0
Bell Creek	Los Angeles	Bacteria	0
Bluff Cove Beach	Los Angeles	Bacteria	0
Brown Barranca/Long Canyon	Ventura	Nutrient	0
Burbank Western Channel	Los Angeles	Nutrient	80
Cabrillo Beach	Los Angeles	Bacteria	0
Calleguas Creek (b)	Ventura	Bacteria	175

Table 2-4
Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted

Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Canada Larga	Ventura	Bacteria	30
Castlerock Beach	Los Angeles	Bacteria	0
Channel Islands Harbor Beach	Ventura	Bacteria	0
Compton Creek	Los Angeles	Bacteria	0
Coyote Creek	Los Angeles/Orange	Bacteria	0
Crystal Lake	Los Angeles	Bacteria	0
Dockweiler Beach	Los Angeles	Bacteria	0
Dominguez Channel (above Vermont)	Los Angeles	Bacteria	0
Dominguez Channel (above Vermont)	Los Angeles	Bacteria	0
Dominguez Channel (Estuary to Vermont)	Los Angeles	Bacteria	0
Dry Canyon Creek	Los Angeles	Bacteria	30
Duck Pond Agric. Drains/Mugu Drain/ Oxnard Drain No. 2	Ventura	Nutrient	25
Echo Park Lake	Los Angeles	Nutrient	0
Elizabeth Lake	Los Angeles	Nutrient	127
El Dorado Lakes	Los Angeles	Nutrient	0
Flat Rock Point Beach Area	Los Angeles	Bacteria	0
Fox Barranca	Ventura	Nutrient	155
Hermosa Beach	Los Angeles	Bacteria	0
Hobie Beach (Channel Islands)	Ventura	Bacteria	0
Inspiration Point Beach	Los Angeles	Nutrient	0
Lake Calabasas	Los Angeles	Nutrient	0
Lake Hughes	Los Angeles	Nutrient	110
Lake Lindero	Los Angeles	Nutrient	0
Lake Sherwood	Los Angeles	Nutrient	20
Las Virgenes Creek	Los Angeles	Bacteria	5
Legg Lake	Los Angeles	Nutrient	0
Lincoln Lake Park	Los Angeles	Bacteria	0
Lindero Creek (all)	Los Angeles	Bacteria	0
Long Point Beach	Los Angeles	Bacteria	0
Los Angeles Harbor Main Channel	Los Angeles	Bacteria	0
LA River (Reach 1)	Los Angeles	Bacteria	0
LA River (Reach 2)	Los Angeles	Bacteria	0
LA River (Reach 3)	Los Angeles	Nutrient	0
LA River (Reach 4)	Los Angeles	Bacteria	0
LA River (Reach 5)	Los Angeles	Nutrient	0
LA River (Reach 6)	Los Angeles	Bacteria	0
Los Cerritos Channel	Los Angeles	Bacteria	0
Lunada Bay Beach	Los Angeles	Bacteria	0
Machado Lake	Los Angeles	Bacteria	0
Malaga Cove Beach	Los Angeles	Bacteria	0
Malibu Lake	Los Angeles	Nutrient	327
Manhattan Beach	Los Angeles	Bacteria	0
Marina Del Ray Harbor	Los Angeles	Bacteria	0
McCoy Canyon Creek	Los Angeles	Bacteria	0
McGrath Beach	Ventura	Bacteria	0
McGrath Lake	Ventura	Bacteria	0
Medea Creek	Los Angeles	Bacteria	350

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Mint Canyon	Los Angeles	Nutrient	30
Munz Lake	Los Angeles	Nutrient	5
Oromond Beach	Ventura	Bacteria	0
Palo Comado Creek	Los Angeles	Bacteria	77
Palo Verdes Shoreline Park	Los Angeles	Bacteria	0
Peck Road Park Lake	Los Angeles	Bacteria	0
Peninsula Beach	Ventura	Bacteria	0
Pico Kenter Drain	Los Angeles	Bacteria	0
Point Fermin Park Beach	Los Angeles	Bacteria	0
Point Vincente Beach	Los Angeles	Bacteria	0
Portuguese Bend Beach	Los Angeles	Bacteria	0
Promenade Park Beach	Ventura	Bacteria	0
Puddingstone Reservoir	Los Angeles	Bacteria	0
Redondo Beach	Los Angeles	Bacteria	0
Resort Point Beach	Los Angeles	Bacteria	0
Rincon Beach	Ventura	Bacteria	37
Rio de Santa Clara/Oxnard Drain No. 3	Ventura	Nutrient	0
Rio Hondo River	Los Angeles	Bacteria	0
Rocky Point Beach	Los Angeles	Bacteria	0
Royal Palms Beach	Los Angeles	Bacteria	0
San Antonio Creek	Ventura	Nutrient	40
San Buenaventure Beach	Ventura	Bacteria	0
San Gabriel River Reach 1	Los Angeles/Orange	Bacteria	0
San Gabriel River Reach 2	Los Angeles/Orange	Bacteria	0
San Jose Creek	Los Angeles	Bacteria	0
Santa Monica Beach	Los Angeles	Bacteria	0
Santa Monica Canyon	Los Angeles	Bacteria	0
Sepulveda Canyon	Los Angeles	Bacteria	0
Stokes Creek	Los Angeles	Bacteria	30
Surfer's Point at Seaside	Ventura	Bacteria	0
Torrance Beach	Los Angeles	Bacteria	0
Torrance Carson Channel	Los Angeles	Bacteria	0
Torrey Canyon Creek	Los Angeles	Bacteria	0
Tujunga Wash	Los Angeles	Bacteria	0
Venice Beach	Los Angeles	Bacteria	0
Ventura Harbor	Ventura	Bacteria	0
Ventura River (Reaches 1, 2 and Estuary)	Ventura	Bacteria	10
Verdugo Wash (all)	Los Angeles	Bacteria	0
Westlake Lake	Los Angeles	Bacteria	0
Wheeler Canyon/Todd Barranca	Ventura	Bacteria	25
Whites Point Beach	Los Angeles	Bacteria	0
Wilmington Drain	Los Angeles	Bacteria	0
Subtotal			**1,688**
Region 5 – Central Valley			
Avena Drain	San Joaquin	Bacteria	2
Calaveras River	San Joaquin	Bacteria	0
Clear Lake	Lake	Nutrient	2,600
Clover Creek	Shasta	Bacteria	15

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Delta Waterways (Stockton Shipping Channel)	San Joaquin	Bacteria	35
Five Mile Slough	San Joaquin	Bacteria	0
French Ravine	Nevada	Bacteria	30
Harding Drain (Turlock Irrigation District)	Stanislaus/Merced	Nutrient	80
Lone Tree Creek	San Joaquin/Stanislaus	Nutrient	35
Middle River	San Joaquin	Bacteria	30
Mormon Slough (Reach 1)	San Joaquin	Bacteria	0
Mormon Slough (Reach 2)	San Joaquin	Bacteria	60
Mosher Slough (Reach 1)	San Joaquin	Bacteria	0
Mosher Slough (Reach 2)	San Joaquin	Bacteria	1
Oak Run Creek	Shasta	Bacteria	25
Old River (San Joaquin and Delta Mendota Canal)	San Joaquin	Nutrient	50
Pit River	Mono, Lassen, Shasta	Nutrient	335
Smith Canal	San Joaquin	Bacteria	0
South Cow Creek	Shasta	Bacteria	10
Stockton Deep Water Channel	San Joaquin	Bacteria	0
Temple Creek	San Joaquin	Nutrient	8
Walker Slough	San Joaquin	Bacteria	70
Whiskeytown Reservoir (areas near Oak Bottom, Brandy Creek and Whiskeytown)	Shasta	Bacteria	10
Wolf Creek	Placer	Bacteria	300
Subtotal			**3,696**
Region 6 – Lahontan			
Big Meadow Creek	El Dorado/Alpine	Bacteria	0
Blackwood Creek	Placer	Nutrient	0
Bridgeport Reservoir	Mono	Nutrient	30
Buckeye Creek	Mono	Bacteria	0
Carson River, West Fork – headwaters to Woodfords	Alpine	Nutrient	5
Carson River West Fork – Woodfords to Paynesville	Alpine	Bacteria	10
Carson River West Fork – Paynesville to Stateline	Alpine	Bacteria	5
Cinder Cone Springs	Placer	Nutrient	0
Crowley Lake	Mono	Nutrient	20
Eagle Lake	Lassen	Nutrient	92
East Walker River, above Bridgeport Reservoir	Mono	Bacteria	2
East Walker River, below Bridgeport Reservoir	Mono	Nutrient	3
Indian Creek	Alpine	Bacteria	1
Pleasant Valley Reservoir	Inyo	Bacteria	0
Robinson Creek, Reach 1	Mono	Bacteria	5
Robinson Creek, Reach 2	Mono	Bacteria	17
Skedaddle Creek	Lassen	Bacteria	2
Swauger Creek	Mono	Bacteria	16

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Tahoe Lake	El Dorado/Placer	Nutrient	0
Tallac Creek	El Dorado	Bacteria	0
Trout Creek (all)	El Dorado	Bacteria	0
Truckee River	El Dorado	Bacteria	22
Twin Lakes	Mono	Nutrient	77
Ward Creek	Placer	Nutrient	0
Subtotal			**307**
Region 7 – Colorado River Basin			
Coachella Valley Storm Drain	Riverside	Bacteria	30
New River	Imperial	Nutrient	35
Palo Verde Drain	Imperial	Bacteria	200
Salton Sea	Riverside/Imperial	Nutrient	29
Subtotal			**294**
Region 8 – Santa Ana			
Big Bear Lake	San Bernardino	Nutrient	140
Buck Gully Creek	Orange	Bacteria	0
Chino Creek	San Bernardino/Los Angeles	Bacteria	30
Cucamonga Creek, Valley Reach	Riverside	Bacteria	40
Lake Fulmor	Riverside	Bacteria	2
Grout Creek	San Bernardino	Nutrient	10
Huntington Beach State Park	Orange	Bacteria	0
Huntington Harbor	Orange	Bacteria	0
Knickerbocker Creek	San Bernardino	Bacteria	0
Los Trancos Creek (Crystal Cove Creek)	Orange	Bacteria	25
Lytle Creek	San Bernardino	Bacteria	530
Mill Creek, Reach 1	San Bernardino	Bacteria	85
Mill Creek, Reach 2	San Bernardino	Bacteria	59
Mill Creek (Prado Area)	Los Angeles	Bacteria	5
Mountain Home Creek	San Bernardino	Bacteria	407
Mountain Home Creek, East Fork	San Bernardino	Bacteria	0
Prado Park Lake	Los Angeles	Bacteria	0
Rathburn Creek	San Bernardino	Nutrient	0
San Diego Creek, Reach 1	Orange	Bacteria	0
Santa Ana River, Reach 3	Orange	Bacteria	0
Santa Ana River, Reach 4	Riverside/Orange	Bacteria	0
Seal Beach	Orange	Bacteria	0
Silverado Creek	Orange	Bacteria	800
Summit Creek	San Bernardino	Nutrient	0
Subtotal			**2,133**
Region 9 – San Diego			
Agua Hedionda Lagoon	San Diego	Bacteria	0
Aliso Creek	Orange	Bacteria	0
Buena Vista Lagoon	San Diego	Bacteria	0
Chollas Creek	San Diego	Bacteria	0
Dana Point Harbor	Orange	Nutrient	0
Forester Creek	San Diego	Nutrient	0
Formosa Slough and Channel	San Diego	Nutrient	0
Guajome Lake	San Diego	Nutrient	0

Table 2-4 Estimated Locations and Numbers of OWTS Adjacent to Impaired Water Bodies that May Be Subject to Section 30040 of the Proposed Regulations Once TMDLs Are Adopted			
Listed Water Body	County	Impairment (a)	Estimated OWTS Within 600 Feet of Impaired Water Body
Hodges Lake	San Diego	Nutrient	57
Loma Alta Slough	San Diego	Bacteria	0
Mission Bay	San Diego	Bacteria	0
Pacific Ocean Shoreline, Aliso	Orange	Bacteria	0
Pacific Ocean Shoreline, Buena Vista Creek	San Diego	Bacteria	0
Pacific Ocean Shoreline, Dana Point	Orange	Bacteria	0
Pacific Ocean Shoreline, Escondido Creek	San Diego	Bacteria	0
Pacific Ocean Shoreline, Laguna Beach	Orange	Bacteria	0
Pacific Ocean Shoreline, Loma Alta	San Diego	Bacteria	0
Pacific Ocean Shoreline, Lower San Juan	Orange	Bacteria	0
Pacific Ocean Shoreline, Miramar	San Diego	Bacteria	0
Pacific Ocean Shoreline, San Clemente	San Diego	Bacteria	0
Pacific Ocean Shoreline, San Diego	San Diego	Bacteria	0
Pacific Ocean Shoreline, San Diequito	Orange	Bacteria	0
Pacific Ocean Shoreline, San Joaquin Hills	Orange	Bacteria	0
Pacific Ocean Shoreline, San Luis Rey	San Diego	Bacteria	0
Pacific Ocean Shoreline, San Marcos	San Diego	Bacteria	0
Pacific Ocean Shoreline, Scripps	San Diego	Bacteria	0
Pacific Ocean Shoreline, Tijuana	San Diego	Bacteria	0
Pine Valley Creek	San Diego	Bacteria	130
San Diego Bay Shoreline, Chula Vista	San Diego	Bacteria	0
San Diego Bay Shoreline, G Street Pier	San Diego	Bacteria	0
San Diego Bay Shoreline, Shelter Island	San Diego	Bacteria	0
San Diego Bay Shoreline, Tidelands Park	San Diego	Bacteria	0
San Diego Bay Shoreline, Vicinity of B Street and Broadway Piers	San Diego	Bacteria	0
San Diego River (Lower)	San Diego	Bacteria	0
San Elijo Lagoon	San Diego	Bacteria	0
San Juan Creek	Orange	Bacteria	329
Santa Margarita Lagoon	San Diego	Nutrient	0
Tecolote Creek	San Diego	Bacteria	0
Tijuana River	San Diego	Bacteria	0
Tijuana River Estuary	San Diego	Bacteria	0
Subtotal			**516**
Total			**14,360**

[a] Bacteria = identified in the pathogens, fecal coliform, total coliform, bacterial indicators, beach closure, Enterococci, enteric viruses, or high coliform count. Nutrients = identified in the TMDL as nutrients, nitrite, nitrate, nitrate as nitrogen, nitrate as nitrate, ammonia, eutrophic contamination, or algae.

[b] A TMDL has been adopted but found that further study is needed to determine whether OWTS are contributing to impairment.

Sources: EPA 2006, State Water Board 2007, 2008

EPA has created maps indicating water bodies that are listed as impaired under Section 303(d) of the Clean Water Act. The State Water Board has modified these maps to show the locations of the two types of water bodies listed in Tables 2-2, 2-3, and 2-4. Because of the scale necessary to review these maps in adequate detail, they are included in Appendix E of this DEIR.

2.6 CONTAMINANTS OF CONCERN

Groundwater exposed to a contaminant plume emanating from conventional OWTS effluent will likely exceed water quality objectives for nitrate and can contain other dissolved contaminants or pathogens (viruses and/or bacteria) not removed by the OWTS (Robertson 1995).

Table 2-5 summarizes the major types of contaminants, or pollutants, found in OWTS discharges and briefly describes the primary reasons why pollutants such as pathogens and nitrogen are a concern.

Table 2-5
Typical Wastewater Pollutants of Concern

Pollutant	Reason for Concern
Total suspended solids and turbidity	In surface waters affected by surfacing on-site wastewater treatment system (OWTS) effluent, suspended solids can cause sludge deposits to develop that smother benthic macroinvertebrates and fish eggs and can contribute to benthic enrichment, toxicity, and sediment oxygen demand. Solids also harbor bacteria. Excessive turbidity resulting from solids that remain suspended can block sunlight, harm aquatic life (e.g., by blocking sunlight needed by plants), and lower the ability of aquatic plants to increase dissolved oxygen in the water column. In drinking water, turbidity is aesthetically displeasing and interferes with disinfection.
Biochemical oxygen demand	Biological stabilization of organics in the water column can deplete dissolved oxygen in surface waters, creating anoxic conditions harmful to aquatic life. Oxygen-reducing conditions in groundwater and surface waters can also cause taste and odor problems in drinking water.
Pathogens	Parasites, bacteria, and viruses can cause diseases through direct and indirect body contact or ingestion of contaminated water or shellfish. A particular threat occurs when OWTS effluent pools on the ground surface or migrates to recreational waters. Some pathogens (e.g., viruses and bacteria) in groundwater or surface waters can travel a significant distance.
Nitrogen	Nitrogen is an aquatic plant nutrient that can contribute to increased growth of aquatic plants and thus the loss of dissolved oxygen in surface waters, especially in lakes, estuaries, and coastal embayments. Algae and aquatic weeds can contribute trihalomethane (THM) precursors to the water column that may generate carcinogenic THMs in chlorinated drinking water. Excessive nitrate-nitrogen in drinking water can cause pregnancy complications for women and methemoglobinemia (blue baby syndrome) in infants. Livestock can suffer health problems from drinking water high in nitrogen.
Phosphorus	Phosphorus is an aquatic plant nutrient that can contribute to increased growth of aquatic plants, including algae, which results in a reduction of dissolved oxygen in inland and coastal surface waters. Algae and aquatic weeds can contribute trihalomethane (THM) precursors to the water column that may generate carcinogenic THMs in chlorinated drinking water.
Toxic organic compounds	A variety of regulated organic compounds exist that cause direct toxicity to humans and aquatic life via skin contact and ingestion. Organic compounds present in household chemicals and cleaning agents can interfere with certain biological processes in alternative OWTS. They can be persistent pollutants in groundwater and contaminate down-gradient sources of drinking water. Some organic compounds accumulate and concentrate in ecosystem food chains.
Heavy metals	Heavy metals like lead and mercury in drinking water cause human health problems. In the aquatic ecosystem, they can be also toxic to aquatic life and accumulate in fish and shellfish that might be consumed by humans.
Dissolved inorganic compounds	Chloride and sulfide cause taste and odor problems in drinking water. Boron, sodium, chlorides, sulfate, and other solutes may limit treated wastewater reuse options (e.g., irrigation). Sodium and, to a lesser extent, potassium can be deleterious to soil structure and OWTS dispersal system performance. Total dissolved solids can pollute water to levels that render it unusable for domestic and agricultural purposes.
Endocrine-disrupting compounds	The presence of common hormones, drugs, and chemicals contained in personal care products (e.g., shampoo, cleaning products, and pharmaceuticals) in wastewater and receiving water bodies is an emerging water quality and public health issue. Endocrine-disrupting compounds (EDCs) are substances that alter endocrine system function and consequently cause adverse health effects on organisms or their offspring. Only recently has it been recognized that EDCs are present in water bodies of the United States at a high frequency; however, measured concentrations have been low and usually below drinking water standards for compounds having such standards. Specific studies have found EDCs in sufficient quantity that they could potentially cause endocrine disruption in some fish. The extent of human health risks and dose responses to EDCs in concentrations at the low levels found in the environment are still unknown.

Source: Adapted from EPA 2002 and Tchobanoglous and Burton 1991

2.6.1 SUPPLEMENTAL TREATMENT PERFORMANCE

To varying degrees, different treatment components and supplemental treatment units described in Section 2.3 reduce the concentrations of contaminants in effluent from OWTS before it is discharged to the dispersal system. Table 2-6 provides estimates of the ranges of typical contaminant concentrations in septic tank effluent with and without effluent filters and the effluent discharged from each major type of supplemental treatment unit.

Table 2-6
Wastewater Constituent Concentrations by Treatment System Type

Treatment System Type	Typical Effluent Constituent Concentrations				
	Biological Oxygen Demand (mg/l)	Total Suspended Solids (mg/l)	Total Nitrogen (mg/l)	Total Phosphorus (mg/l)	Fecal Coliform Bacteria (MPN/100 ml)
Septic Tank					
Without effluent filters	150–250	40–140	50–90	12–20	10^6 to 10^8
With effluent filters	100–140	20–55	50–90	12–20	10^6 to 10^8
Aerobic Treatment Systems					
Suspended growth	<5 to <50	<5 to 60	<5 to 60	<1 to >10	<2 to <$4x10^5$
Attached growth	<5 to <30	<5 to <30	<10 to >60	<1 to 15	<2 to <10^5
Anoxic systems	<10 to <50	<10 to <60	<10 to <20	<5	<$5x10^3$

Notes: mg/L = milligram per liter; MPN/100 ml = Most Probable Number per 100 milliliters
Source: Data compiled from Crites and Tchobanoglous 1998, EPRI 2001, EPA 2002, and Leverenz, Tchobanoglous, and Darby 2002

Table 2-6 provides a summary of typical effluent concentrations expected after pretreatment using different treatment technologies. This table was prepared based on a review of data presented in Crites and Tchobanoglous (1998), Siegrist et al. (2001), and Leverenz, Tchobanoglous, and Darby (2002). The ranges identified in these sources were not always identical. Therefore, the ranges provided represent the low and high end of all the data sources reviewed.

Effluent concentration data for some constituents of concern listed in Table 2-6 are not readily available in the literature. Sources of these constituents, their potential effects, possible source control measures, and factors affecting removal of these constituents by OWTS is discussed in the following narrative.

Disinfection systems are not included in Table 2-6. Data on disinfection system performance are not readily available in the literature. Factors affecting the performance of disinfection systems are discussed below. (Water quality objectives and other standards are described in Section 4.1, “Water Quality and Public Health.”).

2.6.2 OCCURRENCE OF OTHER CONSTITUENTS OF CONCERN

ORGANIC WASTEWATER COMPOUNDS

Household, industrial, and agricultural pesticides; pharmaceuticals; and endocrine-disrupting compounds are newly recognized classes of organic compounds that are often associated with wastewater. These organic wastewater compounds are characterized by high usage rates, potential health effects, and continuous release into the environment through human activities (Halling-Sorensen et al. 1998, Daughton and Ternes 1999). Organic wastewater compounds can enter the environment through a variety of sources and may not be completely removed in wastewater treatment systems (Richardson and Bowron 1985, Ternesa et al. 1996, Ternes 1998) resulting in potentially continuous sources of organic wastewater compounds to surface water and groundwater.

The continual introduction of organic wastewater compounds into the environment may have undesirable effects on humans and animals (Daughton and Ternes 1999). Much of the concern has focused on the potential for endocrine disruption (change in normal processes in the endocrine system) in fish. Field investigations in Europe and the United States suggest that selected organic wastewater compounds (nonionic-detergent metabolites, plasticizers, pesticides, and natural or synthetic sterols and hormones) have caused changes in the endocrine systems of fish (Purdom et al. 1994, Jobling and Sumpter 1993, Folmar et al. 1996, Folmar et al. 2001, Goodbred et al. 1997).

An additional concern is the introduction of antibiotics and other pharmaceuticals into the environment. Antibiotics and other pharmaceuticals administered to humans and animals are not always completely metabolized and are excreted in urine or feces as the original product or as metabolites (Daughton and Ternes 1999). The introduction of antibiotics into the environment may result in strains of bacteria that become resistant to antibiotic treatment (Daughton and Ternes 1999).

Toxic organic compounds (TOCs), which are usually found in household products like solvents and cleaners, are also of concern. The TOCs that have been found to be the most prevalent in wastewater are 1, 4-dichlorobenzene, methylbenzene (toluene), dimethylbenzenes (xylenes), 1,1-dichloroethane, 1,1,1-trychloroethane, and dimethylketone (acetone). No studies are known to have been conducted to determine toxic organic treatment efficiency in single-family home septic tanks. A study of toxic organics in domestic wastewater and effluent from a community septic tank found that removal of low molecular-weight alkalized benzenes (e.g., toluene, xylene) was noticeable, whereas virtually no removal was noted for higher molecular-weight compounds (DeWalle et al. 1985). Removal efficiency was observed to be directly related to tank detention time, which is directly related to settling efficiency. It should be noted that significantly high levels of toxic organic compounds can cause tank (and biomat) microorganisms to die off, which could reduce treatment performance. On-site systems that discharge high amounts of toxic organic compounds might be subject to EPA's Class V Underground Injection Control Program and to other applicable California environmental regulations and statutes other than AB 885.

DISSOLVED INORGANIC COMPOUNDS

Total Dissolved Solids

Total dissolved solids (TDS) is a measure of the combined content of inorganic and organic substances that can pass through a filter in water or wastewater. The most common constituents of TDS are calcium, phosphate, nitrates, sodium, magnesium, potassium and chloride. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is generally considered not as a primary pollutant (e.g., it is not deemed to be associated with health effects), but it is rather used as an indication of the aesthetic characteristics of drinking water.

Nitrates

Nitrate is a salt of nitric acid with an ion composed of one nitrogen and three oxygen atoms (NO_3). It is the naturally occurring chemical that remains after animal or human waste breaks down or decomposes. Excessive nitrate in drinking water can cause pregnancy complications for women and methemoglobenemia in infants.

Chlorides

Chloride concentration in wastewater is an important parameter regarding wastewater reuse applications.
In wastewater, chlorides are added through usage. For example, human excreta, contains approximately 6 grams of chlorides per person per day. In areas where the hardness of water is high, use of regeneration-type water

softeners will also add large quantities of chlorides. Conventional methods of wastewater treatment do not remove chloride to any substantial extent.

In one study, chloride concentrations in septic tank effluent were found to range from <40 to >100 milligrams per liter (mg/l) (Anderson et al. 1994).

Sulfides

Sulfate ion occurs naturally in most water supplies and is also present in wastewater. Sulfate is reduced biologically, under anaerobic conditions, to sulfide, which, in turn, can combine with hydrogen to form hydrogen sulfide. Hydrogen sulfide can then be oxidized biologically to sulfuric acid, which can be corrosive to concrete.

Heavy Metals

Studies have found the presence of some metals in septic tank effluent (Otis et al. 1978, DeWalle et al. 1985). Metals can be present in the domestic waste stream because many commonly used household products contain metals. Aging interior plumbing systems may contribute lead, cadmium, and copper (Canter and Knox 1986). Other sources include vegetable matter and human excreta.

Removal of sources of metals from the wastewater stream by altering user habits and implementing alternative disposal practices is recommended. In addition, the literature suggests that improving treatment processes by increasing septic tank detention times, ensuring greater unsaturated soil depths, and improving dose and rest cycles may decrease risks associated with metal loadings from on-site systems (Chang and Page 1985, Evanko and Dzombak 1997, Lim et al. 2001).

2.7 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS

The primary public health and environmental issues of concern associated with the use of OWTS consist of:

- direct human exposure to OWTS effluent surfacing above an improperly sited or designed dispersal field;
- degradation of groundwater quality attributable to percolating OWTS effluent beneath a dispersal field;
- degradation of surface water by groundwater that is affected by OWTS effluent; and
- human exposure to affected groundwater or surface water, either through direct ingestion or through skin contact.

2.7.1 DIRECT HUMAN EXPOSURE TO SURFACING EFFLUENT

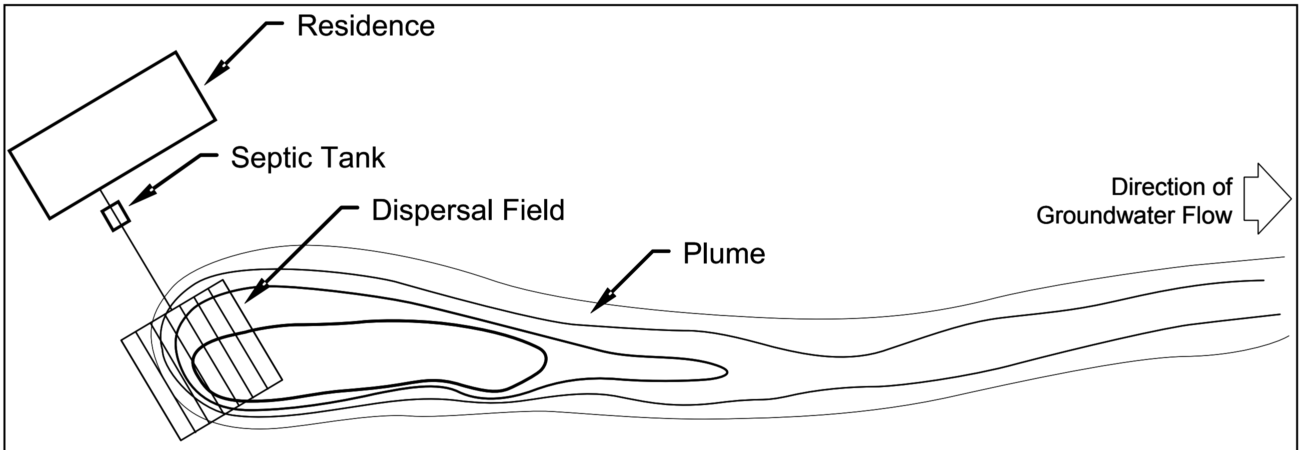
Most “failures” of OWTS are reported as surfacing effluent above the dispersal field, which allows for the possibility of direct human contact with minimally treated sewage. The causes of such failures may be attributable to clogging of the dispersal system or the inability of soils in the OWTS dispersal field to percolate effluent downward. To avoid surfacing effluent, OWTS should be designed and sited to prevent solids from passing from the septic tank to the dispersal field and to ensure that the application rate of effluent and the soil conditions in the dispersal field will allow percolation.

2.7.2 GROUNDWATER DEGRADATION

In most hydrogeologic settings in California, percolating effluent from OWTS will, at some point, reach groundwater. The primary concern relates to the extent the effluent is treated before the effluent makes contact with groundwater. In fractured rock environments, OWTS effluent may travel long distances quickly without dilution or soil filtration, potentially resulting in pollution of groundwater. In porous sedimentary environments, the risk of OWTS effluent polluting groundwater depends on the type and depth of soils between the bottom of the dispersal system and the groundwater table and how well the groundwater is protected by confining layers. In unconfined conditions, OWTS effluent can infiltrate directly to groundwater, carrying potential contaminants with it. Contaminants may be filtered by the soil to a greater or lesser extent, depending on how porous the soil is and the nature of the contaminant. Where the soil is sandy or porous, water flows more quickly through the subsurface. Thus, greater soil depths may be required to ensure adequate treatment of some wastewater contaminants before they reach groundwater. Nitrogen compounds in OWTS effluent typically are fully transformed to nitrate in well-aerated, deep soils. Nitrate is not attenuated in soils and will move freely with downward percolating effluent into groundwater. Pathogen die-off in well-aerated, deep soils is typically good, but if the movement of effluent through the soils is fast and the depth of soil is limited, pathogens may not be inactivated and removed before reaching groundwater. Where groundwater is under confined or semiconfined conditions because of the presence of one or more low-permeability layers (i.e., clay or silt) overlying the groundwater, vertical migration of effluent is slowed, providing time for increased pathogen die-off before reaching groundwater. In addition, certain nutrients such as phosphorus are removed in these layers as a result of adsorption to the clay minerals.

2.7.3 HUMAN EXPOSURE TO OWTS-DEGRADED GROUNDWATER

Wells located downgradient from OWTS are susceptible to pollution when the well draws its water from an area located in the path of an OWTS effluent plume. Upon reaching the groundwater table, OWTS effluent will move with groundwater flow as a contaminant plume. In general, contaminant plumes tend to be long, narrow, and definable and exhibit little dispersion (EPA 2002) (Exhibit 2-3), and OWTS effluent plumes in groundwater tend



Source: Adapted from EPA 2002

Example of OWTS Effluent Plume Movement **Exhibit 2-3**

to remain relatively intact over longer distances. For example, as reported in EPA's *Onsite Wastewater Treatment Systems Manual* (EPA 2002), a 1995 study by Robertson and Cherry determined that such plumes can remain narrow and concentrated for more than 300 feet. The degree of possible impact depends on a variety of factors, including local hydrogeology (e.g., in a fractured rock environment, OWTS effluent may travel long distances in rock fractures without dilution), whether hydrogeologic barriers (e.g., clay or hardpan) exist that separate shallow groundwater from the area where the domestic well draws water, the degree to which the domestic well casing reaches and is sealed into a hydrogeologic barrier that prevents or impedes the downward migration of shallow groundwater to the well intake screens, and the length and adequacy of the sanitary seal (if one exists) on the domestic well. Note that in fractured rock, hydrogeologic barriers do not exist, meaning that sanitary seals may be less protective than in a groundwater table environment. Domestic water supply wells are vulnerable to pollution from OWTS effluent plumes. California has a large number of domestic drinking water wells (approximately

600,000, extrapolated from 1990 U.S. Census data) that may be vulnerable to pollution from the discharges of existing or yet-to-be-installed OWTS. Typical local codes specify a minimum 100-foot separation between an OWTS and a domestic drinking water well. Although public wells are also vulnerable to pollution, they tend to be deeper with longer sanitary seals (unlike private wells), are tested regularly, are required to meet water quality standards, and often provide water that is subjected to additional treatment that protects consumers.

Members of two bacteria groups, coliforms and fecal streptococci, are used as indicators of possible wastewater contamination because they are commonly found in human and animal feces. Although they generally are not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoa that also live in human and animal digestive systems. Bacteriophage (viruses that infect bacteria) have been proposed for use as indicators for virus, but their effectiveness has not been fully demonstrated, and they are not yet widely used. Protozoan indicator organisms are uncommon.

The most commonly tested fecal bacteria indicators are total coliforms, fecal coliforms, *Escherichia coli*, fecal streptococci, and enterococci. All but *E. coli* are composed of a number of species of bacteria that share common characteristics, such as shape, habitat, or behavior; *E. coli* is a single species in the fecal coliform group. Total coliforms are a group of bacteria that are widespread in nature. All members of the total coliform group can occur in human feces, but some can also occur in animal manure, soil, submerged wood, and other places outside the human body. Thus, the usefulness of total coliforms as an indicator of fecal contamination depends on the extent to which the bacteria species found are fecal and human in origin. For drinking water, total coliforms are the standard test because their presence indicates contamination of a water supply by an outside source. Fecal coliforms, a subset of total coliform bacteria, are more fecal specific in origin. For recreational waters, this group was the primary bacteria indicator until relatively recently, when EPA began recommending *E. coli* and enterococci as better indicators of health risk from water contact. *E. coli* is a species of fecal coliform bacteria that is specific to fecal material from humans and other warm-blooded animals. EPA recommends *E. coli* as the best indicator of health risk from water contact in recreational waters. Fecal streptococci generally occur in the digestive systems of humans and other warm-blooded animals. In the past, fecal streptococci were monitored together with fecal coliforms and a ratio of fecal coliforms to streptococci was calculated. This ratio was used to determine whether the contamination was of human or nonhuman origin. However, this is no longer recommended as a reliable test. Enterococci are a subgroup within the fecal streptococcus group. Enterococci are distinguished by their ability to survive in saltwater, and in this respect they more closely mimic many pathogens than do the other indicators. Enterococci are typically more human specific than the larger fecal streptococcus group. EPA recommends enterococci as the best indicator of health risk in saltwater used for recreation and as a useful indicator in freshwater as well.

GROUNDWATER AMBIENT MONITORING AND ASSESSMENT PROGRAM

One source of information on groundwater degradation in the vicinity of OWTS discharges is a separate State Water Board program established by the California Legislature to monitor groundwater quality throughout the state. As part of the Groundwater Ambient Monitoring and Assessment Program, groundwater from domestic water supply wells is sampled with the permission of the homeowner. From 2001 to the present, the program has sampled more than 900 domestic wells in Yuba, El Dorado, Tehama, and Tulare Counties. Yuba and El Dorado Counties are located in the western Sierra Nevada foothills and have fractured rock underlying most of the land surface. Tehama County is in the northern Sacramento Valley and is located primarily on alluvial soils. Tulare County is in the southern San Joaquin Valley and is located on the west side of the Sierra Nevadas. The geology consists primarily of valley alluvial soils and Sierra fractured rock.

Samples of water were taken from these domestic wells and tested for a broad suite of chemicals, including wastewater chemicals. All samples testing positive for total coliform were automatically analyzed for fecal coliform. Of the 513 wells sampled in Yuba and El Dorado Counties, 139 wells (27%) tested positive for total coliform bacteria, and of those, 16 wells tested positive for fecal coliform bacteria (3%). In El Dorado County, naturally occurring groundwater has little if any dissolved nitrates. A total of 296 wells (about 58%) had nitrates at concentrations exceeding 9 parts per million, a level that confirms the source is from human activity, such as septic systems. These levels indicate that contaminants from human activities are reaching these wells. The usual sources of nitrogen in rural areas are fertilizer application, dairy farms, and OWTS. However, there is not widespread agricultural activity in El Dorado County. In Tehama County, of 224 domestic wells sampled, 58 (26%) tested positive for total coliform bacteria, and of those, four wells tested positive for fecal coliform bacteria. In Tulare County, of 101 wells sampled, 75 (41%) had nitrates exceeding the drinking water standard of 45 parts per million, and 60 wells (33%) tested positive for total coliform.

Although the analyses were not designed to determine the source of the pollution, it is reasonable to conclude that effluent from on-site systems, either moving in fractured rock or moving as a contaminant plume in groundwater, is a potential source of contamination for nearby domestic wells because of the short travel distance between many on-site systems and domestic wells, the limited dilution or dispersion in either hydrogeologic environment, and the inherent vulnerability of these wells.

2.7.4 SURFACE WATER DEGRADATION

Where groundwater is hydrologically connected to surface waters, OWTS contaminant plumes traveling with the groundwater have the potential to degrade surface water quality. Surfacing effluent from OWTS dispersal systems that reach adjacent surface water bodies (e.g., streams, lakes, marine waters) can also cause pollution and endanger public health, often resulting in beach closures. The water quality objectives most commonly exceeded in surface waters because of OWTS discharges are those for nitrogen and bacteria. Public health concerns are commonly associated with recreational contact of surface waters impaired by OWTS discharges.

2.8 EXISTING OWTS REGULATIONS IN CALIFORNIA

The existing regulatory framework surrounding installation, operation, and maintenance of OWTS is complex and varies at the regional and local levels throughout California. This section provides a brief overview of this setting to help the reader understand one of the driving forces behind the intent of AB 885. See Chapter 3.0, “Regulatory Setting,” for more information on the laws, policies, and programs administered to regulate the operation, maintenance, and monitoring of OWTS in California.

A broad network of federal and state laws provides the State Water Board, Regional Water Boards, California Department of Public Health (DPH), and local environmental and public health agencies with the authority to protect beneficial uses of water, including the protection of drinking water and public health, by regulating OWTS discharges and other sources of contaminants that have the potential to cause adverse water quality effects. These laws include the federal Water Pollution Control Act of 1972 (Clean Water Act), Safe Drinking Water Act of 1974, subsequent amendments to these laws, and California’s Porter-Cologne Water Quality Control Act of 1969 (Water Code Section 13000 et seq.), its subsequent amendments, and related state policies.

The State Water Board is supported by nine Regional Water Boards (Exhibit 2-4) that work independently of each other but in cooperation with the environmental and public health agencies of the counties, cities, and, in some cases, special districts that have been created to help regulate or finance OWTS. As further described below, the Regional Water Boards often rely on these local agencies to help them implement and enforce OWTS-related policies and regulations.

In accordance with Section 13260 of the Water Code, anyone proposing to discharge waste that may adversely affect surface waters or groundwater of the state must file a report of waste discharge with the Regional Water Board. The Regional Water Board may decide to issue waste discharge requirements (WDRs) or to waive such requirements. Water Code Section 13269 allows the State Water Board or the Regional Water Board to conditionally waive WDRs for a specific discharge or a type of discharge when it is not against public interest.

Number	County Name
1	ALAMEDA
2	ALPINE
3	AMADOR
4	BUTTE
5	CALAVERAS
6	COLUSA
7	CONTRA COSTA
8	DEL NORTE
9	EL DORADO
10	FRESNO
11	GLENN
12	HUMBOLDT
13	IMPERIAL
14	INYO
15	KERN
16	KINGS
17	LAKE
18	LASSEN
19	LOS ANGELES
20	MADERA
21	MARIN
22	MARIPOSA
23	MENDOCINO
24	MERCED
25	MODOC
26	MONO

Number	County Name
27	MONTEREY
28	NAPA
29	NEVADA
30	ORANGE
31	PLACER
32	PLUMAS
33	RIVERSIDE
34	SACRAMENTO
35	SAN BENITO
36	SAN BERNARDINO
37	SAN DIEGO
38	SAN FRANCISCO
39	SAN JOAQUIN
40	SAN LUIS OBISPO
41	SAN MATEO
42	SANTA BARBARA
43	SANTA CLARA
44	SANTA CRUZ
45	SHASTA
46	SIERRA
47	SISKIYOU
48	SOLANO
49	SONOMA
50	STANISLAUS
51	SUTTER
52	TEHAMA
53	TRINITY
54	TULARE
55	TUOLUMNE
56	VENTURA
57	YOLO
58	YUBA

Source: State Water Board 2001

Regional Water Quality Control Board and County Boundaries **Exhibit 2-4**

Historically, Regional Water Boards have waived WDRs for all but the largest OWTS. Regulation of OWTS was, for the most part, deferred to local agencies responsible for issuing building permits for OWTS. In 2000, amendments to Water Code Section 13269 terminated all such waivers for OWTS effective June 30, 2004. Any subsequent waiver must be consistent with regulations adopted pursuant to Water Code Section 13291 (AB 885).

The State Water Board proposes both to adopt regulations pursuant to AB 885 and to adopt a statewide conditional waiver of WDRs that implements the regulations. Owners of new and existing OWTS will not have to file a report of waste discharge (e.g., apply for WDRs), provided that the OWTS owner complies with the provisions of the waiver and the applicable Regional Water Board basin plan.

AB 885 provides specific direction from the legislature to the State Water Board to provide statewide minimum requirements related to the permitting and operation of OWTS. Typically, Regional Water Boards have adopted minimum requirements for OWTS in their water quality control (basin) plans and have worked with local agencies (counties, cities, and special districts) through a formal or informal agreement. When a Regional Water Board and local agency enter into such an agreement, the local agency commits to implement basin plan requirements for OWTS at the local level.

The current practice of regulating OWTS has led to inconsistencies among the various Regional Water Boards and among the numerous local agencies in California's 58 counties. For example, although most counties have some type of minimum performance requirements and siting and design requirements specifically for OWTS, such requirements vary greatly from one jurisdiction to another. In fact, California is one of only two states that do not have statewide OWTS regulations.

The inconsistency in regional and local OWTS requirements and related lack of statewide regulations, along with the public health and environmental issues—and related incidents—summarized in Section 2.7, "Public Health and Environmental Concerns," above, are the primary reasons why AB 885 was introduced by Assemblymember Hannah Beth Jackson in February 1999 and passed by the California Legislature and signed into law by Governor Gray Davis in September 2000.

2.9 ASSEMBLY BILL 885 AND THE DEVELOPMENT OF THE STATEWIDE REGULATIONS

AB 885 requires the State Water Board to develop statewide OWTS regulations in consultation with DPH, the Coalition of California Directors of Environmental Health (CCDEH), the California Coastal Commission (CCC), counties, cities, and other interested parties. During 2000–2002, the State Water Board held numerous meetings and discussions with agencies, stakeholders, and interested parties, such as EPA, DPH, CCC, CCDEH, the California Onsite Wastewater Association, the National Onsite Wastewater Recycling Association, and university departments performing related research. During 2003 and 2004, the stakeholders reviewed and provided input on three different drafts of the regulations.

AB 885 also requires the regulations to include, at a minimum, these seven types of requirements (often referred to as AB 885's "seven points"):

1. Minimum operating requirements that may include siting, construction, and performance requirements
2. Requirements for OWTS adjacent to waters listed as impaired under Section 303(d) of the Clean Water Act
3. Requirements authorizing local agency implementation
4. Corrective action requirements
5. Minimum monitoring requirements
6. Exemption criteria
7. Requirements for determining when an existing OWTS is subject to major repair

AB 885 further requires the Regional Water Boards to incorporate the new statewide regulations into their basin plans. Neither the legislation nor the proposed OWTS regulations preempt the ability of the Regional Water Boards or any local agency to adopt or retain performance requirements for OWTS that are more protective of public health or the environment than the new statewide regulations.

2.10 PROJECT OBJECTIVES

Based on the requirements of AB 885 and the intent of the state legislature in drafting the legislation, and in the context of other state laws relating to wastewater discharge and water quality, the State Water Board has identified the following objectives for the proposed project:

- In accordance with the requirements of AB 885, adopt statewide OWTS regulations and a statewide conditional waiver that are consistent with other provisions of the Porter-Cologne Water Quality Control Act and related state water quality control plans and policies adopted by the State Water Board.

- Adopt a statewide conditional waiver to comply with Section 13269 of the California Water Code.

- Help to ensure that public health and beneficial uses of the state's waters are protected from OWTS effluent discharges.

- Ensure that the development of the statewide regulations and conditional waiver consider economic costs, practical considerations for implementation, and technological capabilities existing at the time of implementation.

2.11 PROPOSED PROJECT—NEW STATEWIDE AB 885 REGULATIONS AND STATEWIDE CONDITIONAL WAIVER

The State Water Board proposes to adopt regulations and a statewide conditional waiver (waiver) that establish minimum requirements for the permitting, monitoring, and operation of OWTS, as required by AB 885.

The waiver allows owners of OWTS to discharge wastewater without having to file a report of waste discharge (and obtain WDRs) with a Regional Water Board as long as the existing or new OWTS and its owner comply with the applicable minimum requirements set forth in the waiver. Because the regulations and waiver contain requirements that are substantially the same requirements for OWTS, this document refers to the regulations; however, both elements are proposed for adoption as the project analyzed in this EIR.

In some cases, such as groundwater monitoring and septic tank inspections, the proposed regulations would impose new requirements on existing OWTS. In other cases, elements of the proposed regulations may already be in use but may vary around the state. See Chapter 3.0, "Regulatory Setting," for more information on the existing regulatory setting at the regional and local levels, including examples of regulations from representative municipalities in the state, presented for comparative purposes.

The proposed regulations have been drafted to fulfill the state mandate and address the seven requirements identified in AB 885 (the "seven points"). Table 2-7 describes the seven points from AB 885 and where in the proposed regulations they are addressed. The regulations are proposed to be adopted by the State Water Board as Sections 30000 through 30040 of the California Code of Regulations, Title 27. The text that follows describes the major elements of the proposed regulations as they relate to the potential for the project to have an impact on the physical environment. Section references are references to specific sections in the proposed regulations, which are included in Appendix B of this EIR.

Table 2-7 The Proposed Regulations and the Seven Points of Assembly Bill 885	
Required Point	Sections in the Regulations Where Addressed
Point 1: Minimum operating requirements	**Article 1, General Provisions:** 30001 SWRCB—Applicability 30002 SWRCB—General Requirements **Article 3, Performance Requirements and Specifications:** 30013 SWRCB—Performance Requirements for Supplemental Treatment Components 30014 SWRCB—Dispersal Systems
Point 2: Requirements for impaired waters, including Clean Water Act Section 303(d)-listed waters	**Article 4, Protecting Impaired Surface Waters:** 30040, SWRCB—Applicability and Requirements
Point 3: Requirements authorizing local implementation	**Article 1, General Provisions:** 30001 SWRCB—Applicability, item (f)
Point 4: Requirements for corrective actions	**Article 1, General Provisions:** 30002 SWRCB—General Requirements, item (w)
Point 5: Minimum monitoring requirements	**Article 1, General Provisions:** 30002 SWRCB—General Requirements, items (s), (t), and (u) **Article 2, Groundwater Level Determinations for New OWTS** 30012 SWRCB—Groundwater Level Monitoring **Article 3, Performance Requirements and Specifications:** 30013 SWRCB—Performance Requirements for Supplemental Treatment Components, items (f), (g), and (h) 30014 SWRCB—Dispersal Systems, item (f)
Point 6: Exemption criteria	**Article 1, General Provisions:** 30001 SWRCB—Applicability, item (e) **Article 2, Groundwater Level Determinations for New OWTS** 30012 SWRCB—Groundwater Level Monitoring, item (b)(5) **Article 4, Protecting Impaired Surface Water:** 30040 SWRCB—Applicability and Requirements, items (d) and (e)
Point 7: Requirements for determining when a system is subject to major repair	**Article 1, General Provisions:** 30000 SWRCB—Definitions
Source: Data compiled by EDAW in 2008	

2.11.1 Section 30000, SWRCB—Definitions

Section 30000 provides definitions for the technical terms used in the proposed regulations. Except where described in this section, definitions of terms are those used in the California Water Code or the Health and Safety Code.

2.11.2 Section 30001, SWRCB—Applicability

The proposed regulations apply to all OWTS, as defined in Section 13290 of the California Water Code. Under that section, OWTS are defined to include "individual disposal systems, community collection and disposal systems, and alternative collection and disposal systems that use subsurface disposal."

As stated in Section 30001(a), "Regional Water Boards and local agencies implementing the OWTS regulations may establish requirements for OWTS that are more protective of water quality than the requirements contained in this Chapter." Thus, OWTS may be prohibited in locations where the Regional Water Board or local agency determines that OWTS cannot be used because of insufficient soil depth or other water quality and public health concerns (Section 30001[g]).

The regulations specify (Section 30001[c]) that, in addition to adhering to these regulations, a property owner must notify the applicable Regional Water Board before:

- operating a new OWTS or relocating, expanding, repairing, or replacing an OWTS that has a capacity of more than 3,500 gallons per day;
- increasing the average pollutant loading of the waste stream entering an OWTS with a capacity to treat more than 3,500 gallons per day;
- changing the nature (e.g., from domestic to commercial) of the waste stream entering an OWTS; or
- discharging wastewater into an OWTS at a volume that exceeds the design flow.

Any of the listed circumstances may prompt the Regional Water Board to require the property owner to obtain WDRs instead of, or in addition to, the AB 885 regulations.

The regulations require that the design of new and replaced OWTS be based on the expected quality of influent wastewater, the quantity of wastewater, site characteristics, and the required level of treatment (in relation to the performance requirements).

The regulations may be implemented through a conditional waiver of WDRs by the State Water Board. OWTS regulated by WDRs may be exempted from the regulations by the Regional Water Board (Sections 30001[d]–30001[e]).

Local agencies may be authorized by the State Water Board or a Regional Water Board to implement all of the regulations through an agreement, adopted resolution, or memorandum of understanding (MOU) (Section 30001[f]). Any MOU, adopted resolution, or agreement must require compliance with all the regulations and the applicable Regional Water Board's basin plan.

2.11.3 SECTION 30002, SWRCB—GENERAL REQUIREMENTS

The requirements listed in Section 30002, as specifically differentiated, apply to existing OWTS, new OWTS installed after the effective date of the regulations, and replaced OWTS (defined in Section 30000 as "an OWTS that has its treatment capacity expanded, or its dispersal system replaced, after the effective date of this Chapter").

Sections 30002(b), 30002(c), and 30002(d) identify general requirements for new and replaced OWTS. These general requirements are the foundation of the performance requirements described later. In particular, the regulations focus on ensuring that new and replaced OWTS are designed to disperse effluent to subsurface soils in a manner that maximizes treatment and aerobic decomposition of soluble and particulate organic compounds and other pollutants in the unsaturated zone (Section 30002[b]), as described above.

Performance requirements for new OWTS require that these systems are designed, operated, and maintained in accordance with the requirements of the regulations.

New and replaced OWTS must be operated to accept and treat domestic-strength wastewater. This includes wastewater that does not exceed established BOD and TSS limits and may include materials generally associated with household activities, such as toilet flushing, food preparation, laundry, household cleaning, and personal hygiene (Section 30002[a]). Certain materials are not permitted to be discharged to OWTS because of their potential to inhibit proper operation of the system (Section 30002[h]). These materials include biocides and all products and matters defined in Title 22 of the California Code of Regulations, Chapter 41, Division 4.5.

Although not a requirement, the regulations recommend that property owners not discharge regenerating saline backwash from water softeners to OWTS or to the ground (Section 30002[v]) to minimize degradation of groundwater from increased salinity.

Other requirements included in this section of the proposed regulations are highlighted below:

- Only "qualified professionals" (defined in Section 30000 and in the licensing categories identified in Section 30002[g]) can perform soil and site evaluations or design new and replaced or expanded OWTS (Sections 30002[e] and 30002[f]). A property owner may install his or her own system subject to inspection and approval by the Regional Water Board or authorized local agency (Section 30002[g]).

  Qualified professionals must prepare operations and maintenance (O&M) manuals for property owners along with a "Record Plan" to help ensure that new OWTS are properly operated and maintained; the contents of the O&M manual and Record Plan are described in Section 30002(i). The Record Plan and O&M manual must be provided to the buyer on transfer of property (Section 30002[k]).

- Owners of all OWTS must retain inspection records for 5 years (Section 30002[l]).

- Owners of new and existing OWTS with supplemental treatment components must maintain a contract with a service provider to operate, maintain, and monitor the system according to the performance requirements described below (Section 30002[j]).

- All septic tanks must be inspected at least once every 5 years to determine that the level of solids is not impairing the performance of the tank (Section 30002[u]). Removal of solids through pumping is recommended (but not required) for any tank that is more than 25% full.

- All new septic tanks shall meet specifications relating to access openings, installation, and filters (Section 30002[o]–30002[r]) that prevent solids greater than 3/16 inch in diameter from passing to the dispersal system.

- Where an OWTS constructed after the effective date of the regulations is determined to require a major repair, the correction must be completed within 90 days of being notified by the local agency or the Regional Water Board (Section 30002[w]). The Regional Water Board may allow the property an additional 90 days (for a total of 180 days) to address the malfunction.

- Owners of new and existing OWTS with domestic wells on their properties must sample and analyze groundwater quality in the vicinity of the OWTS discharge (Section 30002[s]). The sampling may be conducted by installing a monitoring well downgradient of and within 100 feet of the OWTS dispersal system or by sampling water from an existing on-site domestic well. This requirement applies within 1 year of the effective date of the regulations for existing OWTS and within 30 days of installation of a new OWTS and every fifth year thereafter. If the facility served by the OWTS gets its drinking water from a community water supply system, groundwater quality monitoring is not required. Monitoring that is carried out every 5 years will provide a level of information not now available, and the level of information will increase each year. Such a monitoring effort is consistent with Water Code Section 13269.

- Section 30002(t) identifies the constituents that must be included in the analysis and describes the process for electronic reporting of results to the State Water Board. A positive test result for total coliform requires that the sample be tested for *Escherichia coli*. Test results would be provided to the property owner and the State Water Board. The names and addresses of the property owners would not be public information.

2.11.4 Section 30012, SWRCB—Groundwater Level Monitoring

Section 30012 describes the process for determining the level of seasonal high groundwater to establish the depth of soil available for siting of an OWTS. If the depth to seasonal high groundwater is known to be greater than 10 feet, based on local knowledge of groundwater conditions, no further evaluation is needed. Otherwise, a site evaluation by a qualified professional is required. The regulations describe various processes for conducting these evaluations based on site-specific conditions.

2.11.5 Section 30013, SWRCB—Performance Requirements for Supplemental Treatment Components

This section of the proposed regulations applies to OWTS with new supplemental treatment components. Section 30013(a) establishes that local agencies or Regional Water Boards may require supplemental treatment to be installed where, because of insufficient soil depths or protection of water quality and public health, conventional systems cannot be used. However, this provision does not require local agencies or Regional Water Boards to permit the use of supplemental treatment components.

The regulations include the following key elements relating to the performance of supplemental treatment components:

- The effluent from supplemental treatment components must meet specified performance requirements before entering the dispersal field. The specified performance standards are as follows:
    - the 30-day average concentration shall not exceed 30 mg/l of BOD (or 25 mg/l of carbonaceous BOD),
    - the 30-day average concentration shall not exceed 30 mg/l of TSS, and
    - where nitrogen removal is required, the 30-day average concentration shall not exceed 10 mg/l of total nitrogen (TN) as nitrogen (Sections 30013[b] and 30013[d]).
- Where disinfection is a part of the treatment process, the 30-day average TSS must not exceed 10 mg/l and the concentration of total coliform bacteria in effluent, at the 95th percentile, must not exceed the following (Section 30013[c]):
    - 10 Most Probable Number (MPN) per 100 milliliters before discharge into the dispersal field where the soils exhibit percolation rates between 1 and 10 minutes per inch or where the soil texture is sand or
    - 1,000 MPN per 100 milliliters before discharge into the dispersal field where the soils exhibit percolation rates greater than 10 minutes per inch or consist of a soil texture other than sand.
- All proprietary supplemental treatment components must be certified by a third-party testing laboratory to meet specified standards for BOD, TSS, TN (as nitrogen), or total coliform, depending on the specific design (Section 30013[e]). Requirements for the testing protocol and detection limits for constituents are also established.
- Because of the greater complexity of OWTS that involve supplemental treatment, supplemental treatment components require ongoing monitoring as specified in the O&M manual for the specific system or as specified by the Regional Water Board (Section 30013[f]). OWTS with supplemental treatment components must be equipped with visual or audible alarms and a telemetric alarm to alert the owner and service provider in case of malfunction (Section 30013[g]). Disinfection process components must be inspected weekly by a service provider or be equipped with a telemetric monitoring system that can continuously assess the

operation of the disinfection system (Section 30013[h]); these systems must be tested quarterly for total coliform.

2.11.6 Section 30014, SWRCB—Dispersal Systems

Under the regulations, dispersal systems are intended to be designed and installed at the shallowest practicable depth to maximize oxygen transfer, biological treatment, evapotranspiration, and vegetative uptake of nutrients. The regulations identify these processes as being elements critical to effective treatment of effluent in the soil (Section 30014[a]). For design purposes, only the bottom area of the dispersal system may be considered as infiltrative surface (Section 30014[b]); design application rates are provided to assist in designing an infiltrative surface area.

This section of the proposed regulations includes the following additional requirements:

- All dispersal systems for conventional OWTS must have at least 3 feet of continuous unsaturated, undisturbed soil below the dispersal system and above seasonal high groundwater or fractured/weathered bedrock. When the soil particle size at a given location cannot meet specified standards (described in Section 30014[c] and the accompanying table and figure), then pressure distribution must be used and alternative minimum depth of undisturbed soil or proportionally lesser application rates are required.

- All dispersal systems for OWTS with supplemental treatment components must have at least 2 feet of continuous unsaturated, undisturbed soil below the dispersal system and above seasonal high groundwater or impermeable strata or fractured/weathered bedrock. When the soil particle size at a given location cannot meet specified standards (described in Section 30014[d] and the accompanying table and figure), the same requirements apply as described above for conventional OWTS.

- Where insufficient depth of undisturbed soil is available to meet the requirements described in Sections 30014(c) and 30014(d), engineered fill and pressure distribution may be used. The regulations provide specifications for the design of engineered fill (Section 30014[e]). Replacement of up to 1 foot of undisturbed soil with engineered fill is allowed at a 1.5:1 ratio (i.e., up to 1.5 feet of engineered fill is permitted to replace up to 1 foot of undisturbed soil where it is lacking).

- Specific types of dispersal systems (gravelless chambers, pressurized drip, seepage pits, evapotranspiration, and infiltration) have performance requirements established in the regulations (Section 30014[i]–30014[l]).

- Conventional dispersal systems with pumps must have visual, audible, or telemetric failure alarms and be designed to accommodate storage for up to 24 hours in the event of pump failure (Section 30014[f]).

2.11.7 Article 4, Protecting Impaired Surface Water (Section 30040)

Section 30040 includes requirements that pertain to all OWTS within 600 feet of surface water bodies listed as impaired (as defined in Section 303[d] of the federal Clean Water Act) for nitrogen or pathogens where a TMDL has been adopted and where OWTS have been determined by the applicable Regional Water Board to be contributing to the impairment. Adoption or amendment of a TMDL may establish a greater or lesser distance requirement than 600 feet (Section 30040[c]). Requirements for construction and operation of OWTS in these impaired areas include the following:

- New OWTS within 600 feet of an impaired water body as described above must meet the performance standards for nitrogen and/or pathogens (whichever is applicable to that water body) identified in the regulations.

- Owners of existing OWTS within 600 feet of an impaired water body must have the system inspected within 1 year of the effective date of the regulations or TMDL approval to determine whether the system contributes to the impairment; standards for conducting this inspection are provided in Section 30040(b)(1). If the system is determined to discharge fecal coliform or nitrogen at greater than 10 mg/l into groundwater, the owner must ensure that the OWTS meets supplemental performance requirements within 4 years.

- Owners of OWTS in areas where a TMDL has been adopted before the effective date of these regulations and that requires the implementation of a wastewater management plan are exempt from these requirements (Section 30040[d]). Also exempt are OWTS owners who commit to connect (within 9 years) to a centralized wastewater collection and treatment system within 48 months of the effective date of the regulations or the applicable TMDL (Section 30040[e]).

2.12 IMPLEMENTATION OF THE PROPOSED REGULATIONS

As required by AB 885, the implementation of new statewide OWTS regulations would commence 6 months after the regulations are adopted by the State Water Board. The State Water Board would implement these regulations with a statewide conditional waiver of WDRs.

The proposed regulations would be largely self-implementing, requiring actions to be completed by the property owner/operator. The regulations would be overseen by the State Water Board and the Regional Water Boards. Local agencies (e.g., county and city departments and independent districts) would continue to oversee local siting approval and compliance with basin plans and local ordinances, as required under existing law. It is also important to note that the proposed regulations would not prevent Regional Water Boards or local agencies from adopting OWTS requirements that are more protective of the environment and public health than the proposed regulations. The proposed regulations would be the minimum requirements for OWTS installation, operation, and maintenance throughout the state.

The proposed statewide waiver that would be established as part of the proposed project would be self-implementing as well. As long as a property owner ensures that his or her OWTS complies with the requirements of the regulations and the waiver, no additional permit or review would be required. Failure to comply with the minimum statewide requirements for construction, operation, and maintenance of OWTS could result in enforcement pursuant to Chapters 4 or 5 of Division 7 of the California Water Code. As a result, the property owner could be required to cease the discharge, submit monitoring results, or submit a report of waste discharge to the Regional Water Board, along with the applicable fee, and the OWTS could be subject to individual WDRs as determined by the Regional Water Board.